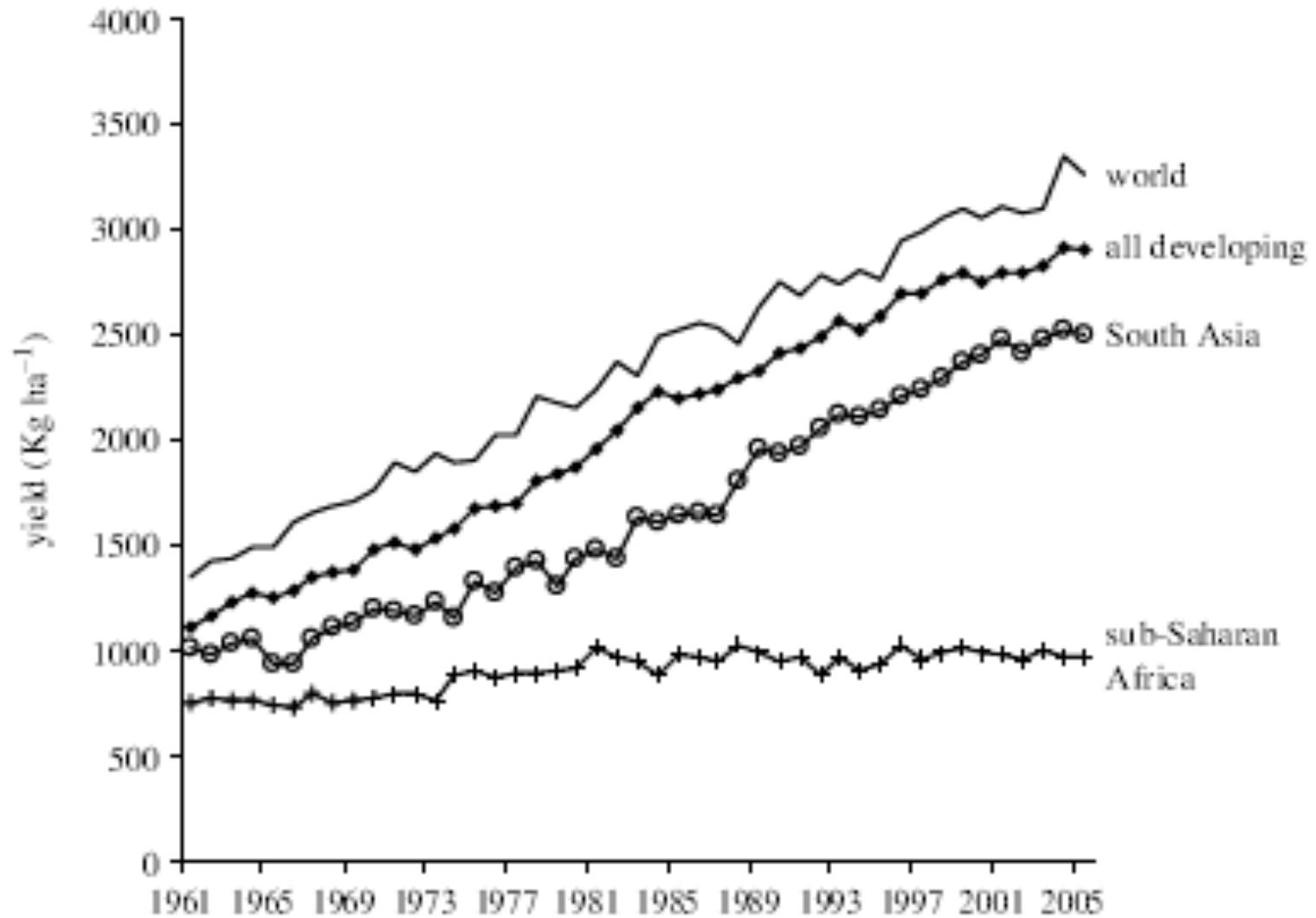


Too Little N and P in Agriculture

How to provide enough?

How to avoid adding too much?

Global trends in cereal yields by region (1961-2005)



From: Hazell and Wood, 2008

Farm Nitrogen Balances (kg/ha/y)

Too much AND too little

	Netherlands	Rwanda
IN		
Mineral fertilizer	440	0.4
Organics	200	1.6
Atom. deposition	50	5.0
N fixation	0	8.8
Others	8	1.8
TOTAL IN	698	17.6
OUT		
Harvested product	82	27.3
IMBALANCE	+616	-10

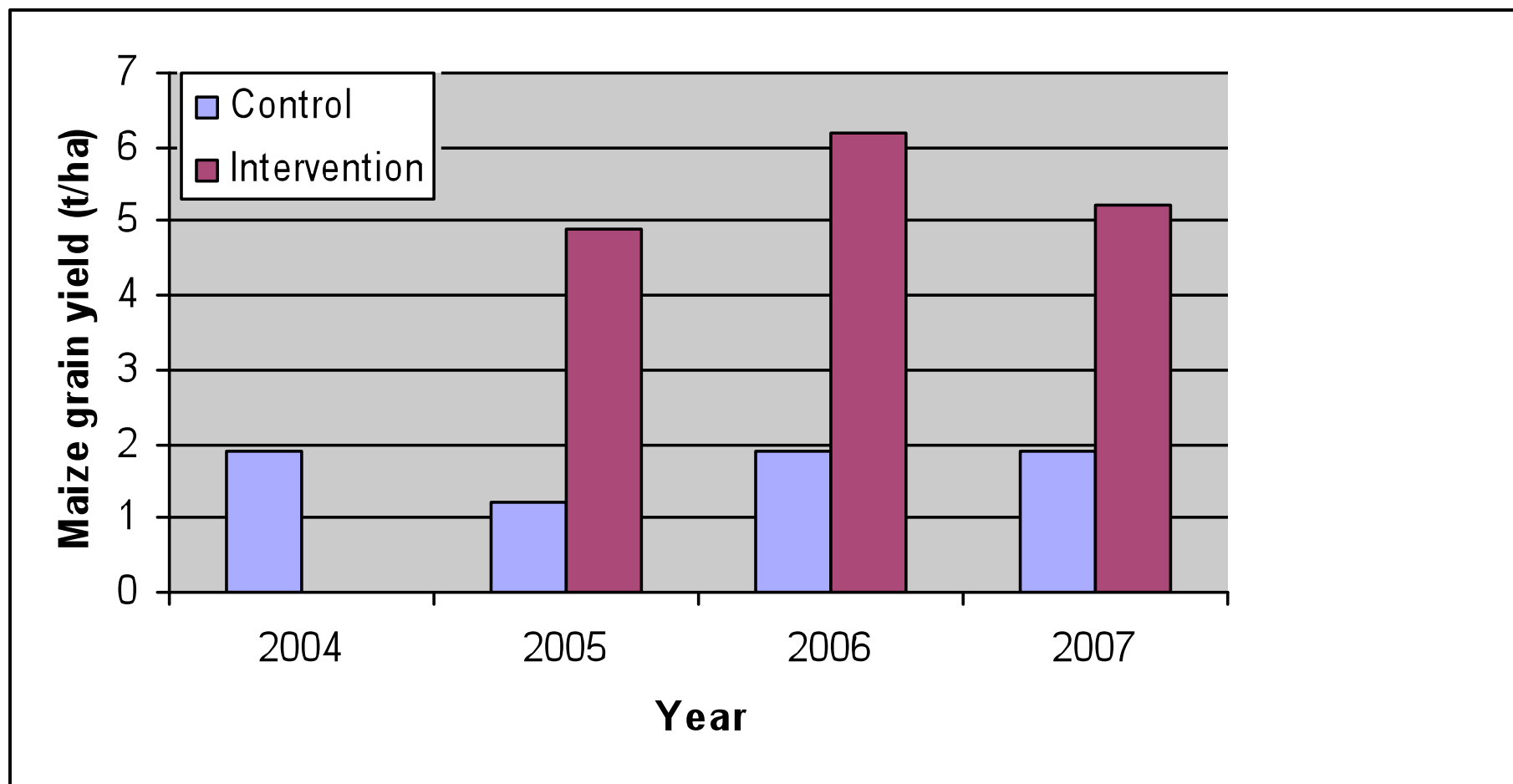
(From: Smaling, 1993)

Pollution

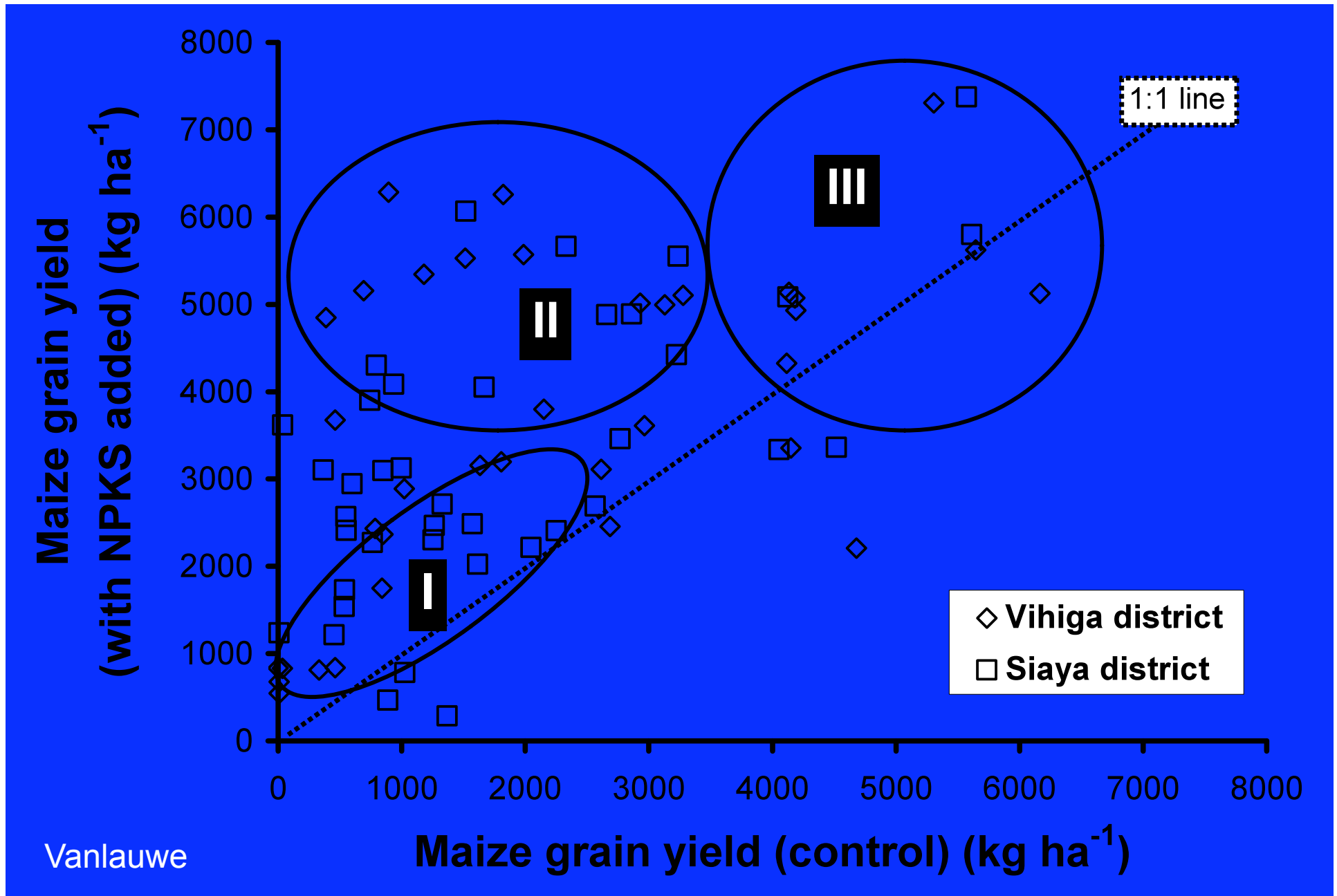
Depletion

Sauri, Kenya – Maize Yields

1000 Households Receiving Subsidized Fertilizer and Improved
Seeds

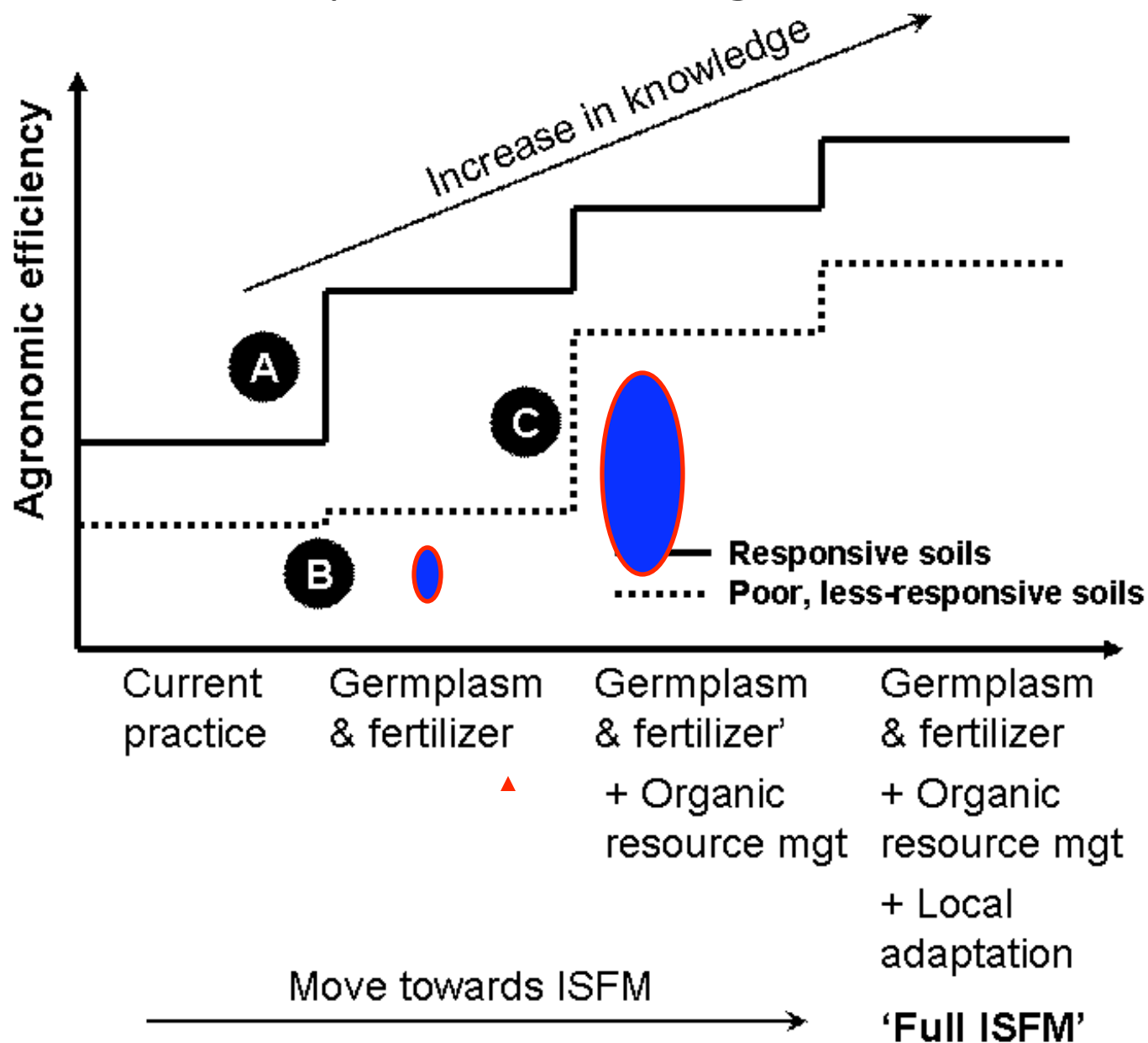


Targeting Fertilizers: What are the soil – site characteristics?



Conceptual Model

Agronomic Efficiency of fertilizers, organic resources, and ISFM



ORGANIC AND INORGANIC INPUTS TO SOIL

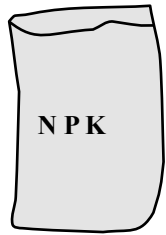
Production and Nutrient Use Efficiency

Treatment	Pearlmillet (t/ha)	N Uptake (kg/ha)	NUE (%)
N0P0	1.51	31	--
N120P40	2.76	66	29
N60P20 + N60 (FYM)	2.81	71	33
N60P20 + N60 (wheat straw)	2.33	51	17
N60P20 + N60 (Sesbania)	3.15	76	38

(Goyal et al., 1992)

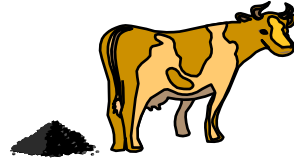
Integrated Soil Fertility Management: Low Adoption Rates of Organic Components

Mineral fertilizer

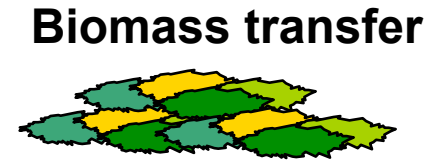


+ Organics

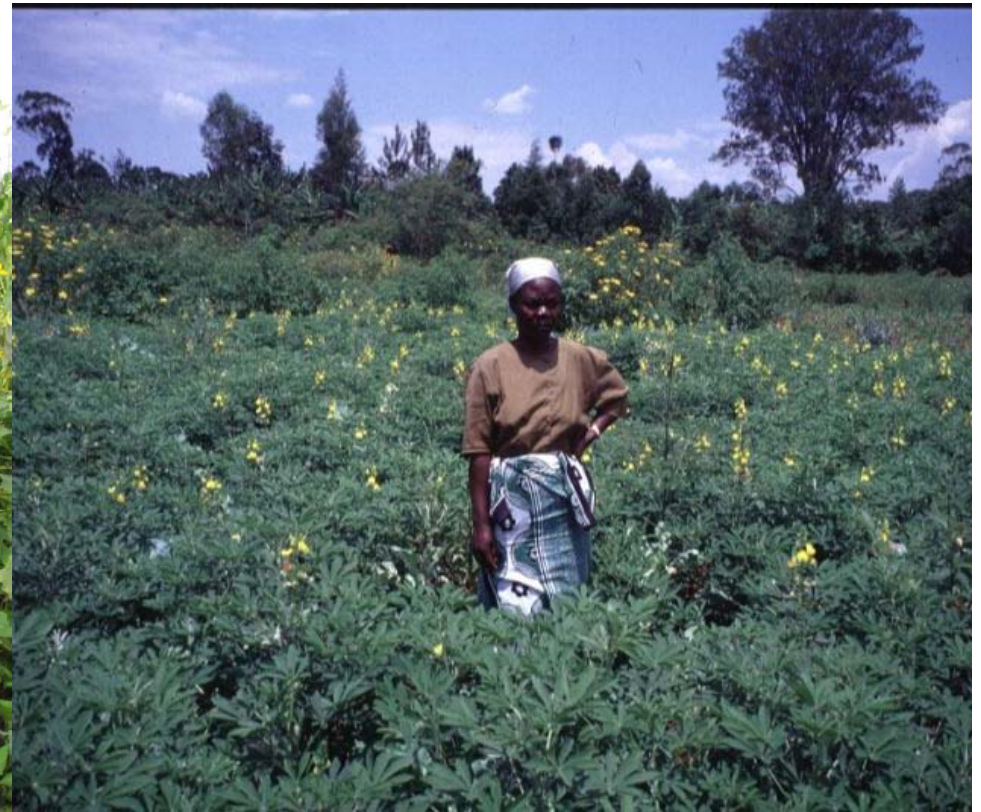
Cover crops Legume trees



Manure



Biomass transfer



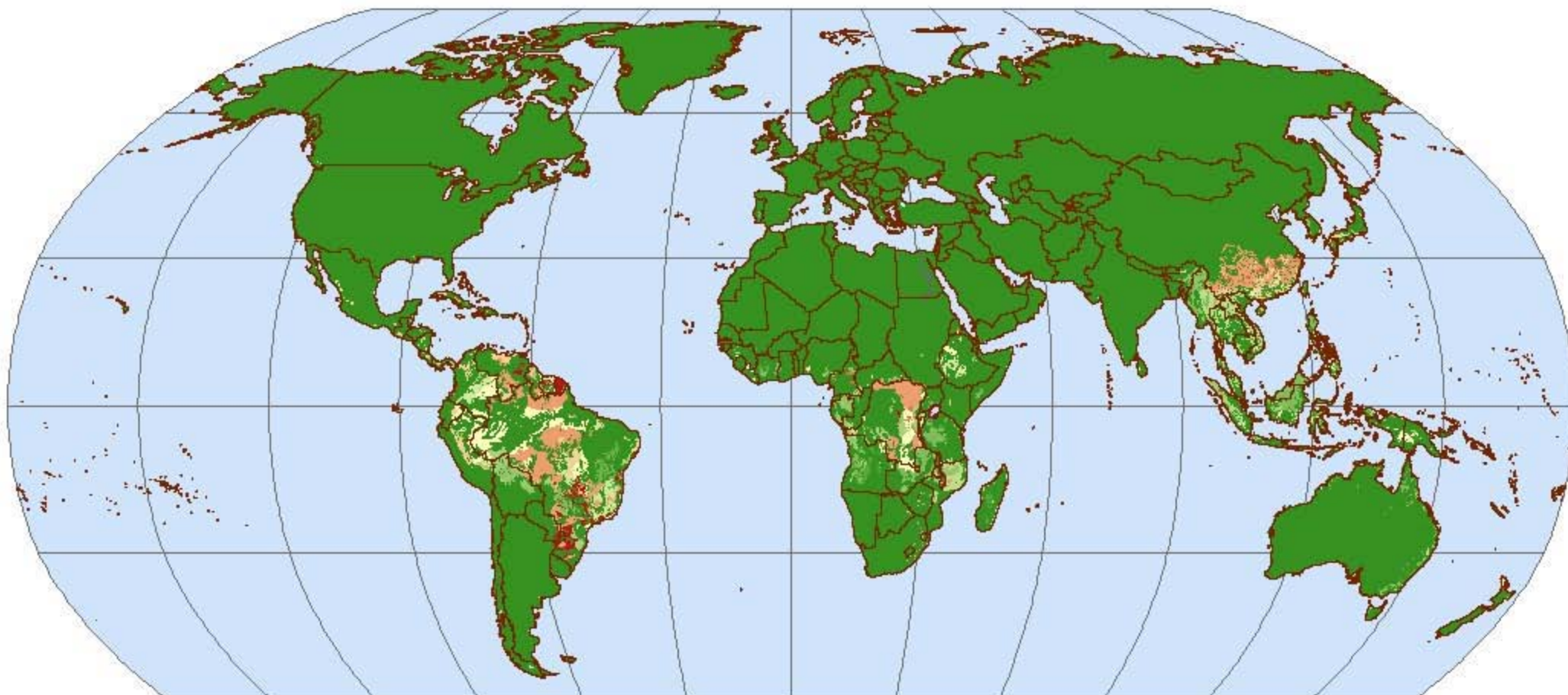
Can we subsidize organic inputs?

Is that sufficient?

How will price of fertilizers impact decisions?

What about PES, such as carbon credits?

PHOSPHORUS LIMITATION TO PRODUCTION?



Robinson Projection

Soil Functional Capacity Classification System, Version 4: High Phosphorus Fixation

Clayey topsoils with more than 20% iron or aluminum oxides in their clay particles 'fix' large quantities of phosphate ions into slowly soluble iron and aluminum phosphates, which, while not immediately available to plants, are made available over a period of several years. This map shows the percentage of FAO map units containing the following soil units, which if they are fine-textured, have been assigned the 'i' modifier to indicate high phosphorus fixation: A, Ao, Af, Ah, Ap, Ag, F, Fo, Fx, Fr, Fh, Fa, Fp, N, Ne, Nd, Nh, Bf, Lf.

Percent Area

'i' modifier



Scale: 1:5 000 000

Implications of P limiting soils

P fertilizers must be added – at least to get the system moving

Animal manures do have sufficient P, but usually not available

Organics add efficiency;

Targeting needs for appropriate fertilizer rates

How can we rapidly identify these soils?

On N fluxes: larger if P requirements not met

The Fate of Added Nutrients: Plot level and Beyond

Need to establish list of site characteristics

Soils, Climate, Topography

Vegetation-type, %cover, distribution

Management practices: intensity

to determine most predominant loss pathways

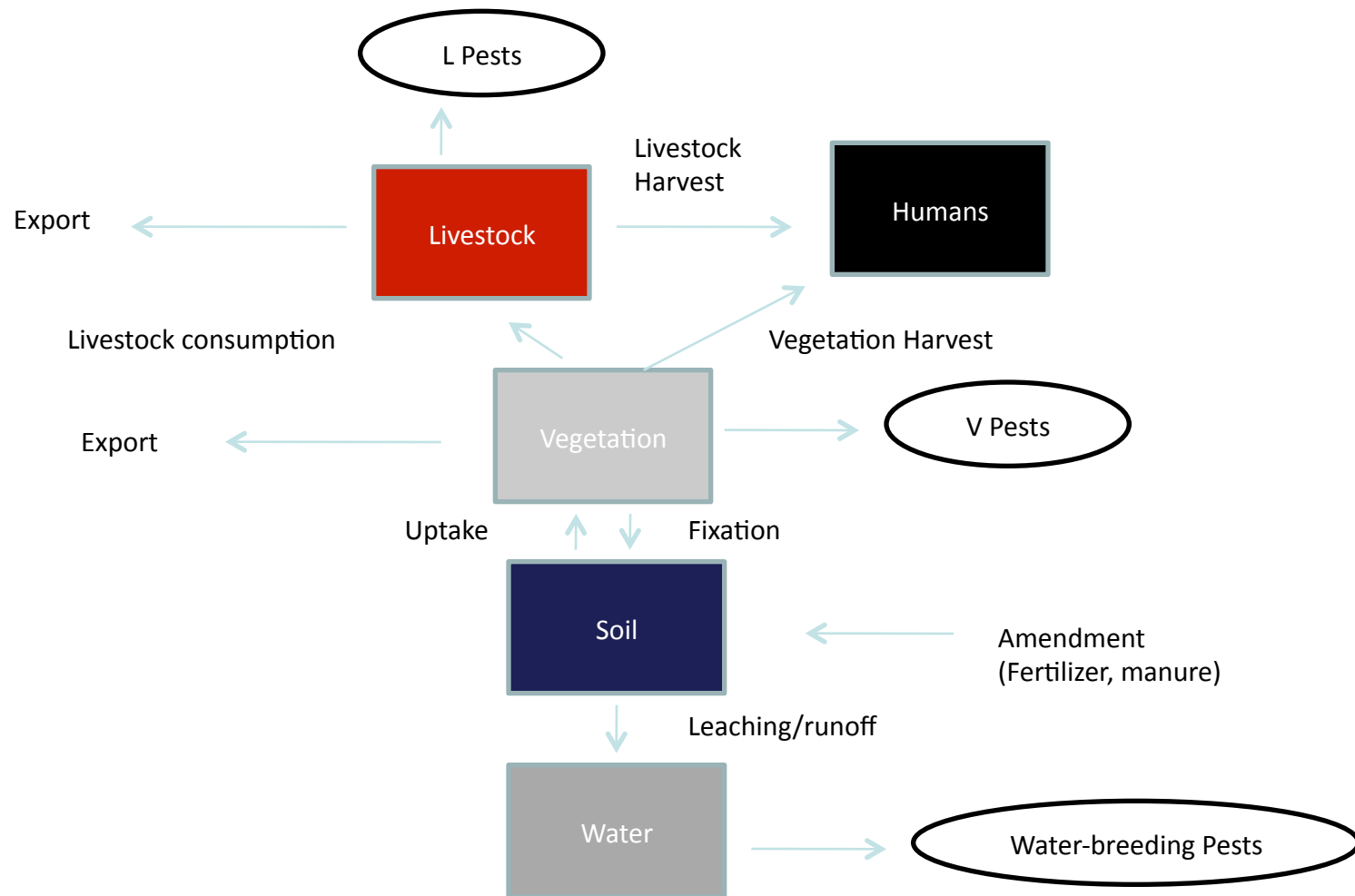
to development management recommendations

Big unknowns:

Commercial plantations

Biofuels in the tropics

System configurations – How does this change N dynamics



....and tradeoffs or synergies

