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Effects of fertilizer & organic resource management practices on crop productivity & NUE in Africa

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5th International Nitrogen Conference, Delhi, 4 December 2010

Background

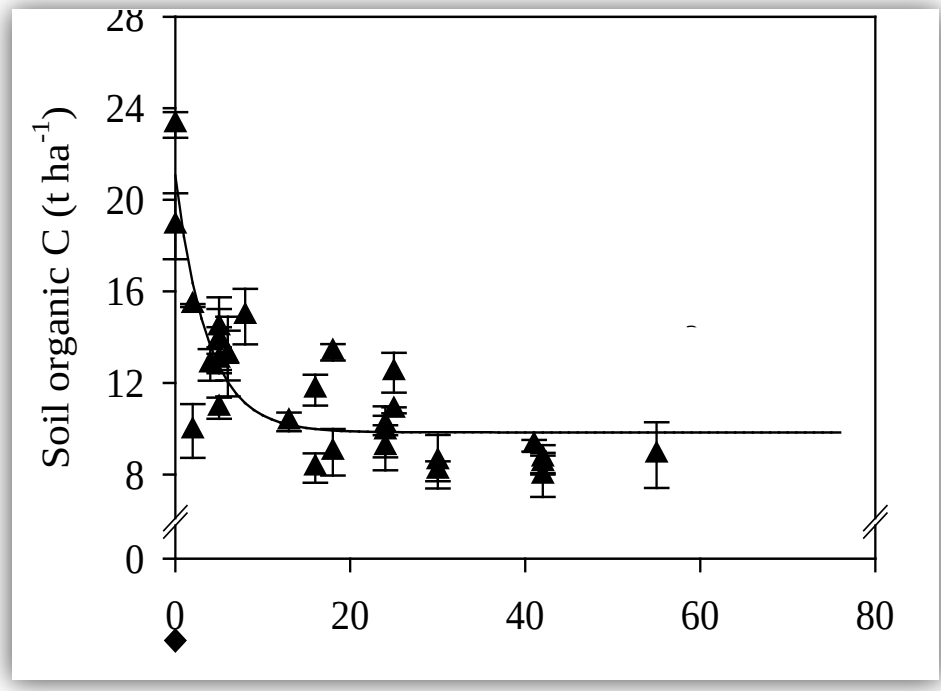
- Poor soil fertility is a major constraint to crop productivity in SSA
- Low fertilizer use
  - ❑Unavailability
  - ❑High costs
  - ❑Viability and risk
- Organic resources
  - ❑Limited availability
  - ❑Low quality
  - ❑High labour demand

N commonly the most limiting nutrient

Background

- Poor soil fertility is a major constraint to crop productivity in SSA

SOC depletion



N balances highly negative

Kenya	-46
Malawi	-67
Nigeria	-37

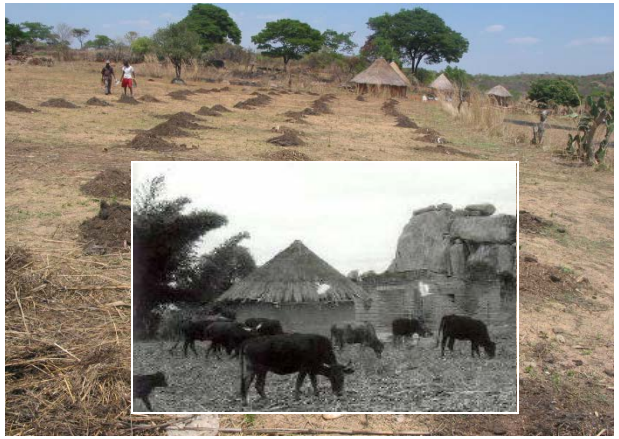
Low N use efficiency

Background

- Efficient use of nutrients in Africa critical to enhance crop productive
- Spatial variability in soil fertility at different spatial scales to due to inherent and management factors a major challenge

Study objective

- To review nutrient management options in SSA agriculture and associated nutrient use efficiencies
- A vital step for magnifying cropping systems or practices that offer best opportunities for intensification



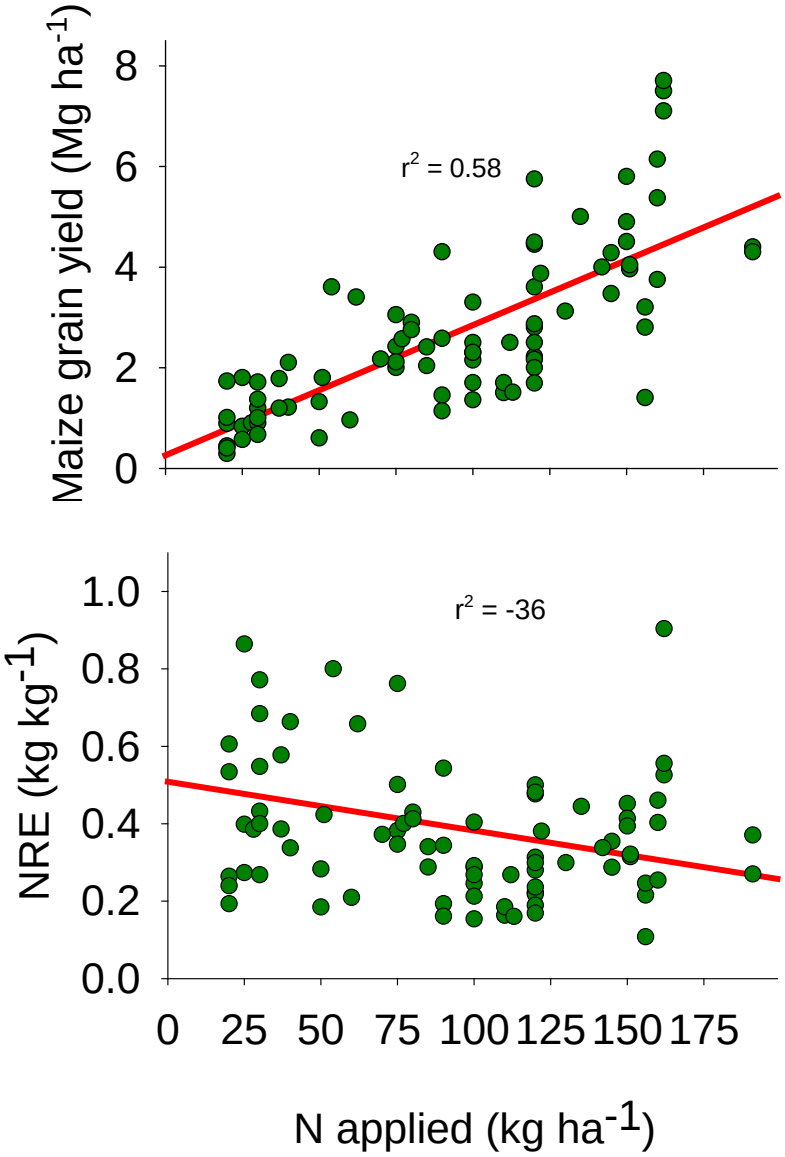
Study approach

- Literature review based on published papers (1990-2009).
- Focused on maize-based system.
- Annual rainfall >700 mm
- Limited analysis to studies that allowed analysis of:
  - ❑Indigenous N supply
  - ❑Crop N uptake
- Nutrient management systems of focus
  - Fertilizer in maize cropping systems
  - Integrated fertilizer and manure
  - Fertilizer in maize-grain legume

Study approach

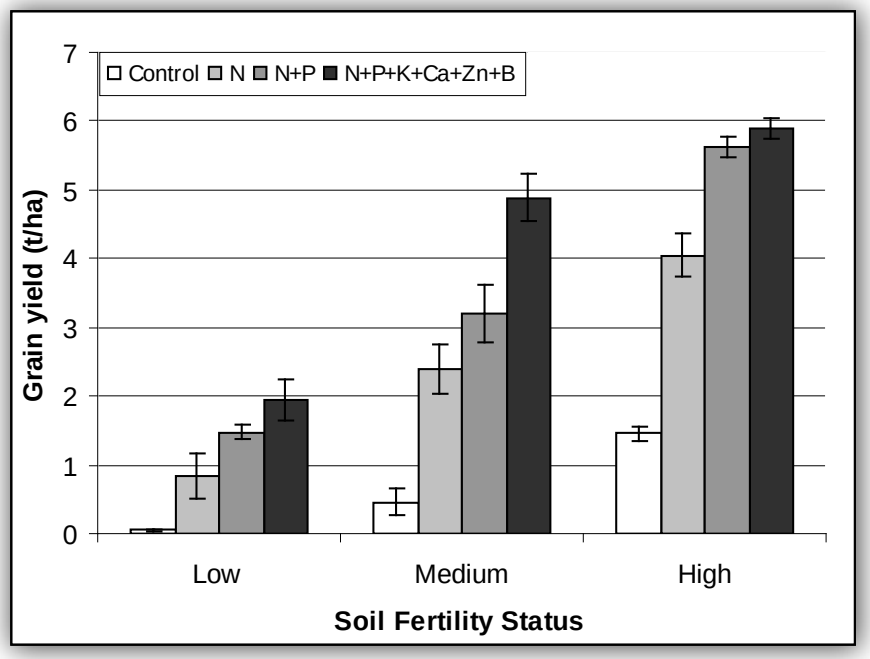
- Fields categorized into low, medium and high fertility based on indigenous N supply potential.

Overall fertilizer N recovery efficiency (NP treatments)



- Maize productivity and NRE highly variable
- General decrease in NRE with increasing N application rate

Enhancing N use efficiency
Soil fertility status and balancing nutrient supply



- Sole N give the highest yield increases
- Multi nutrient application required to reduce the yield gap between high and medium fertility soils
- Attainable yields very low in low fertility fields

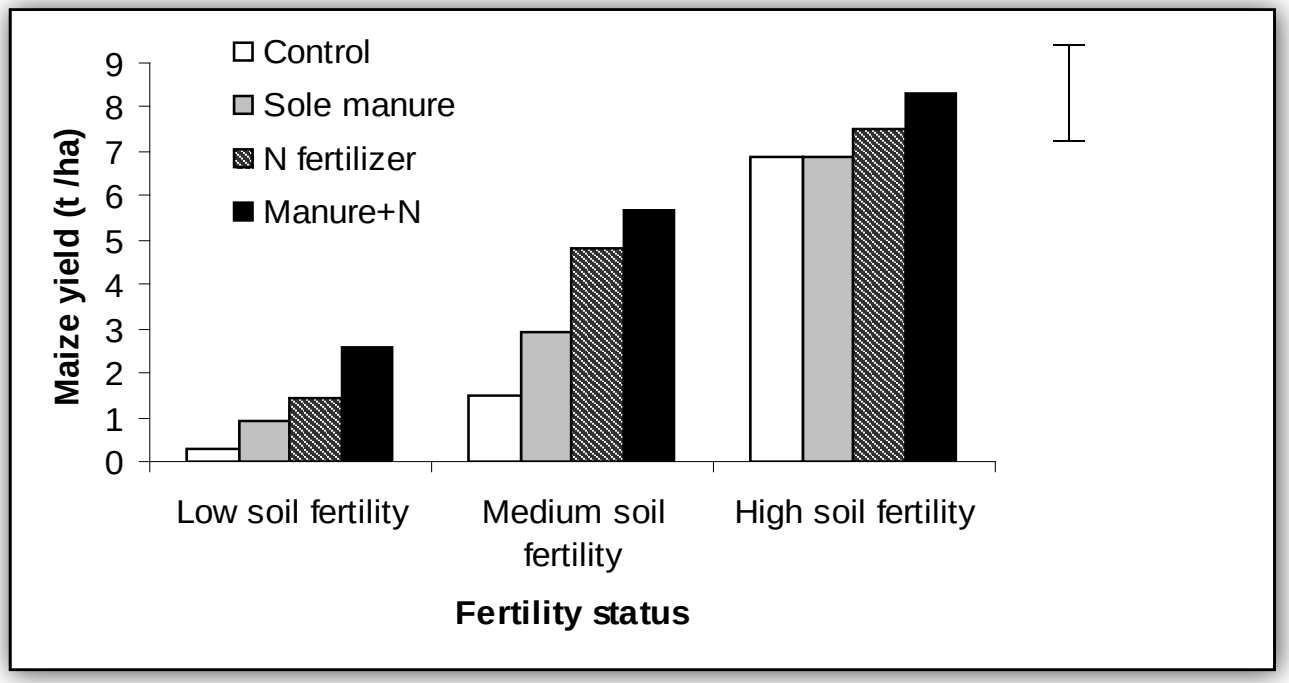
Yields and N recovery efficiency from livestock manure

	Min	Max	Mean	*CV*
N applied (kg ha^{-1})	25	433	132	*59*
Maize yields (Mg ha^{-1})	0.4	5.9	2.4	*52*
NRE (kg kg^{-1})	-0.1	0.63	0.25	*77*

Yields and N recovery efficiency in grain legume rotations

	Min	Max	Mean	*CV*
N applied (kg ha^{-1})	13	223	146	*78*
Maize yields (Mg ha^{-1})	0.3	6.2	2.1	*68*
NRE (kg kg^{-1})	0.05	0.45	0.11	*71*

Integrated N fertilizer and manure



Conclusions

- N efficiencies in maize based systems cropping systems in SSA are diverse
  - Variable soil fertility conditions
  - Nutrient management practices
- Degraded soils that respond poorly to nutrient management a major challenge.
- Flexible systems of nutrient management should be tailored to farmers' access to resources and varying soil fertility conditions on the basis of:
  - Appropriate N application rates
  - Balanced nutrient management
  - Combination of N fertilizers with manure
  - Integration of grain legumes

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Thank you

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