

# Keynote address

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*Alliance for a Green Revolution in Africa (AGRA)*

# Soil health for food security and Climate Change Adaptation in Africa

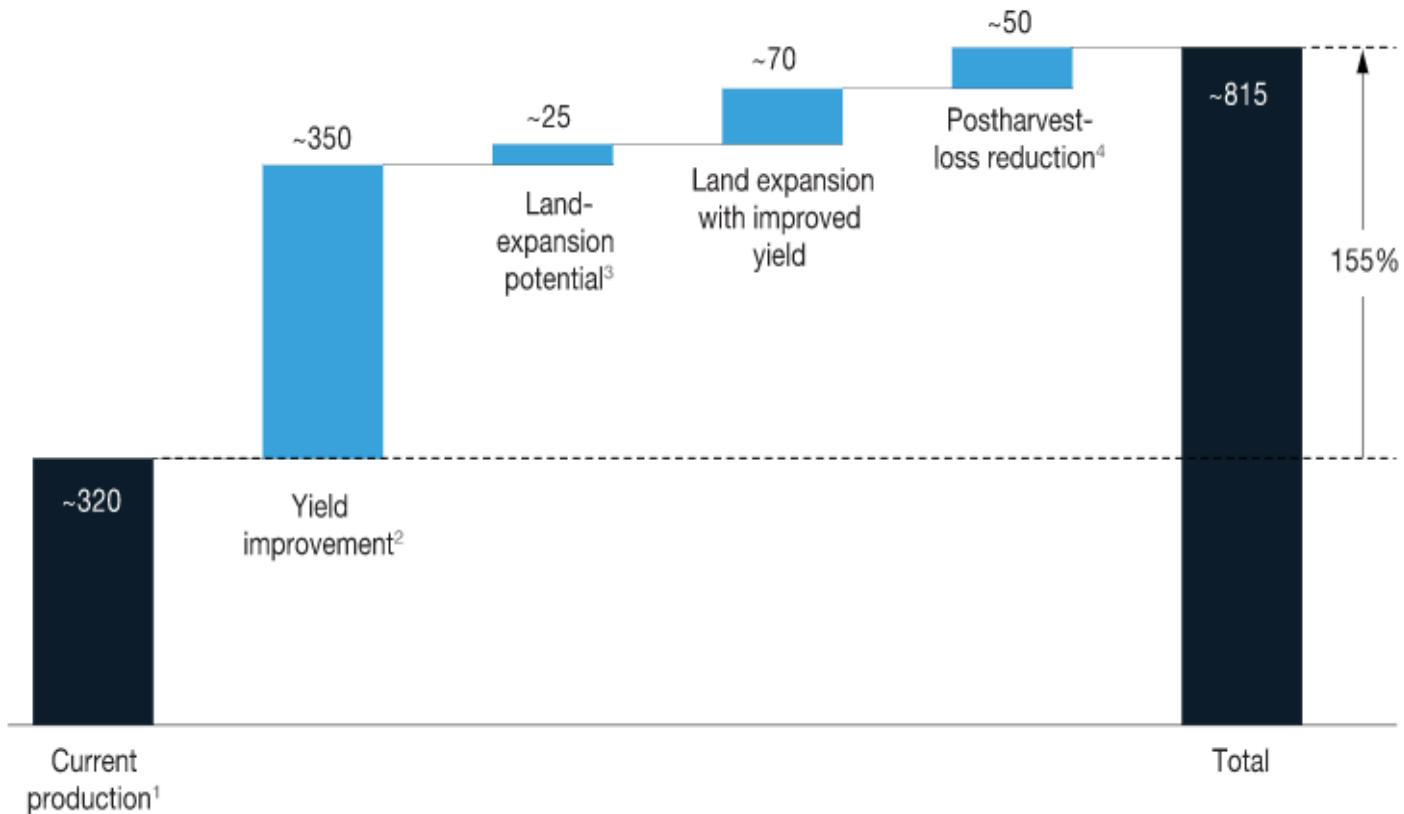
**Tilahun Amede**

**Alliance for a Green Revolution in Africa**

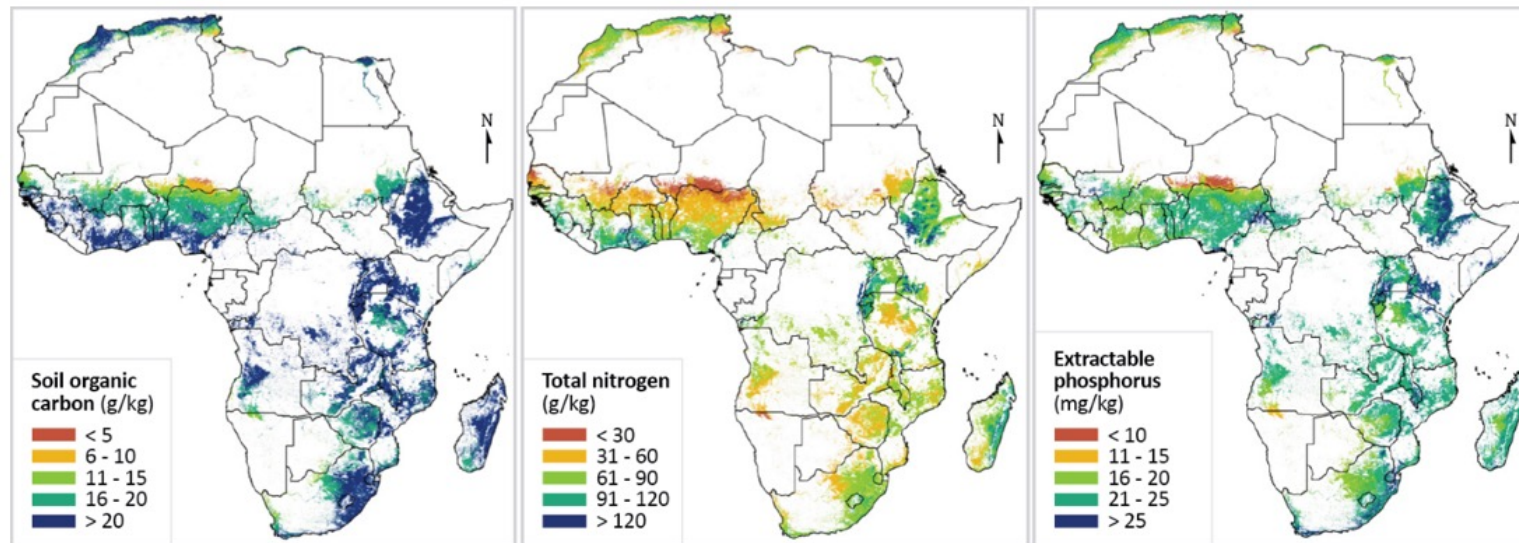
BDU, 29.05.2023



# Without an increase in agricultural productivity /sustainable intensification/ SSA will struggle to feed its people



# Distribution of three important soil fertility parameter (SOC, total N, and extractable phosphorous) in Africa

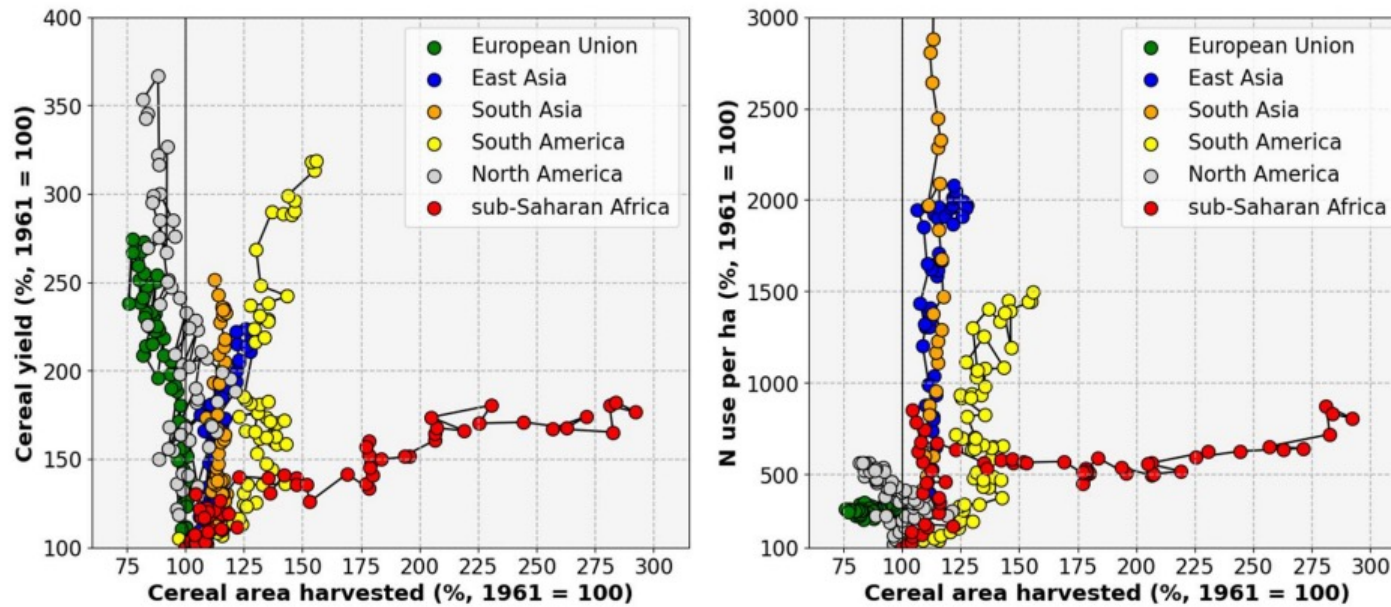


Data source: iSDA soil: Open Soil Data for Africa. Hengl, T., MacMillan, R.A., (2019)

iSDA



# Crop productivity is strongly linked to Nitrogen use and efficiency



Analysis by João Vasco Silva, based on FAOSTAT.

**Figure 1. Past intensification and area expansion trajectories of staple cereal production across different regions of the world: (a) cereal yields by percentage of cereal area harvested (Giller et al., 2021); (b) N use per hectare per percentage of cereal area**

# Soil organic matter dictates nutrient use efficiency (N) and returns per investment

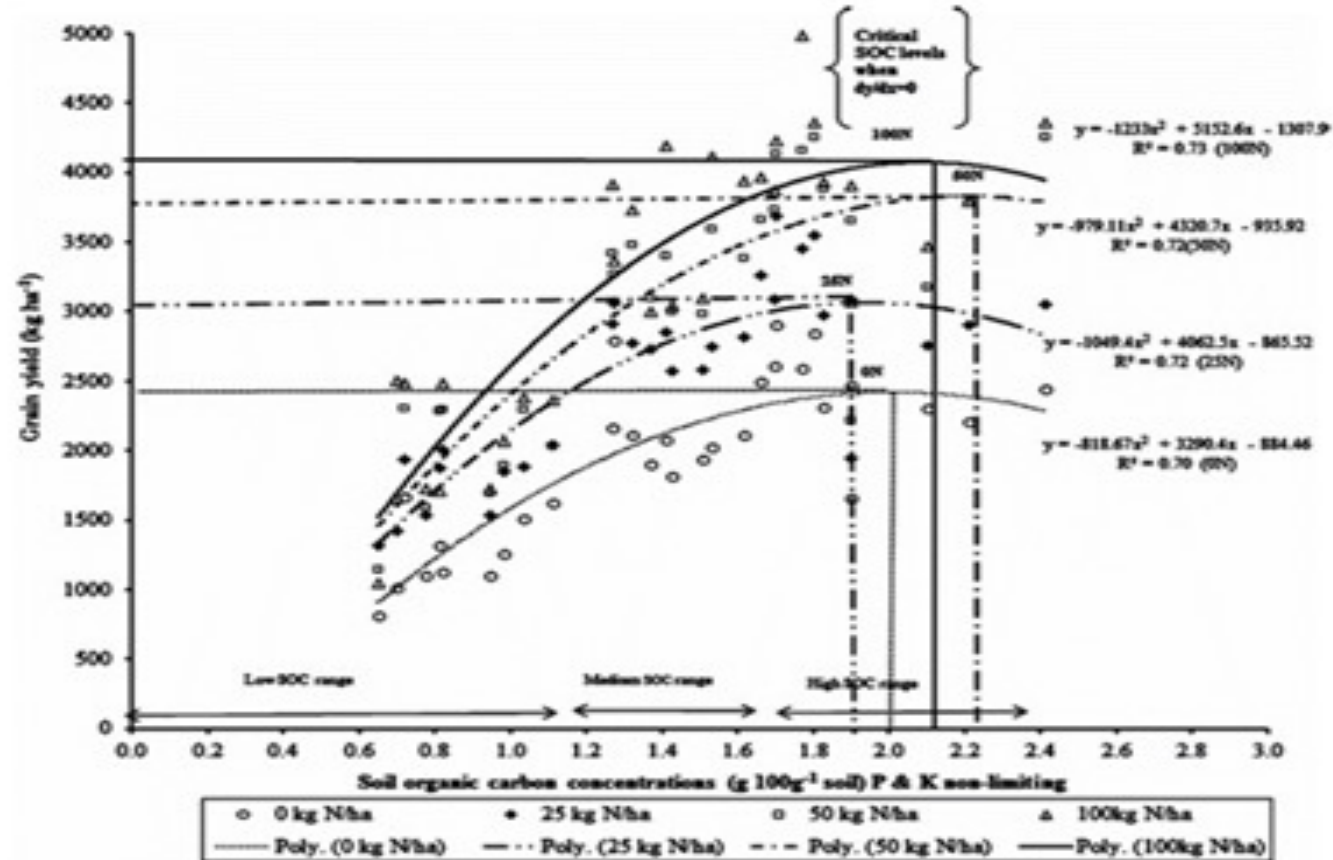
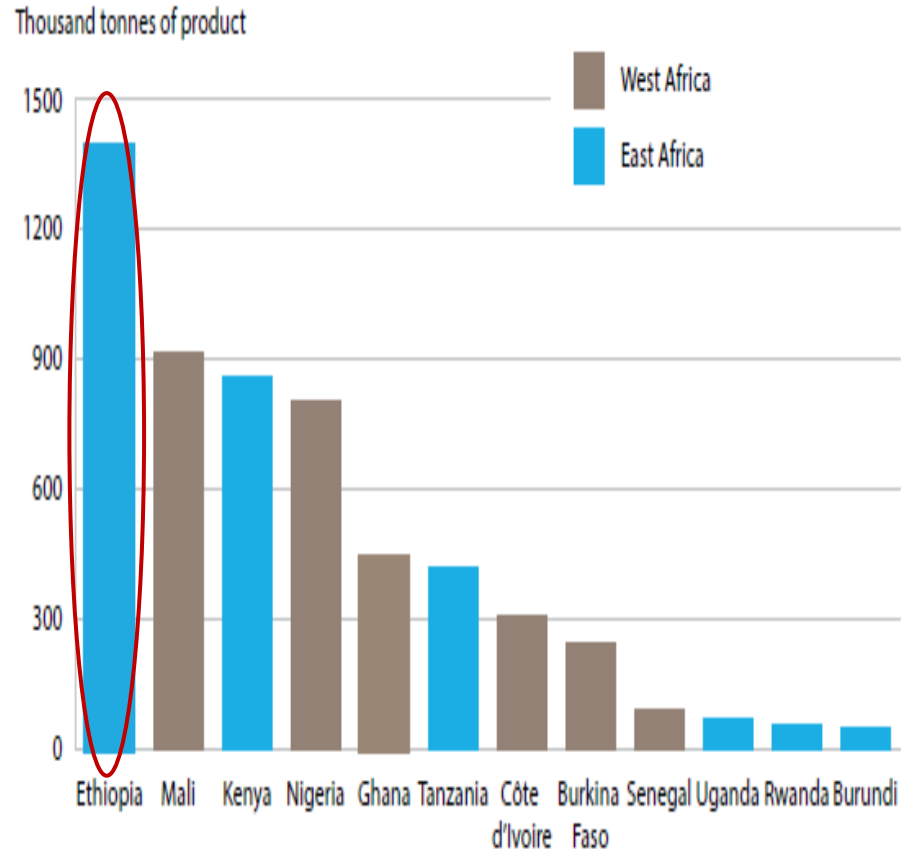


Fig 18: Non-linear model fitting of maize grain yield response to added nitrogen fertilizer under soils of different SOC ranges in a Ferrosol in Uganda (from: Musinguzi et al, 2016).

# Increased fertilizer use in selected countries, and increasing fertilizer cost

Except in Ethiopia, Malawi, and Nigeria, the proportion of households using chemical fertilizers is too low to maintain or restore soil nutrients removed by plants in the other ten countries (WB, 2015)



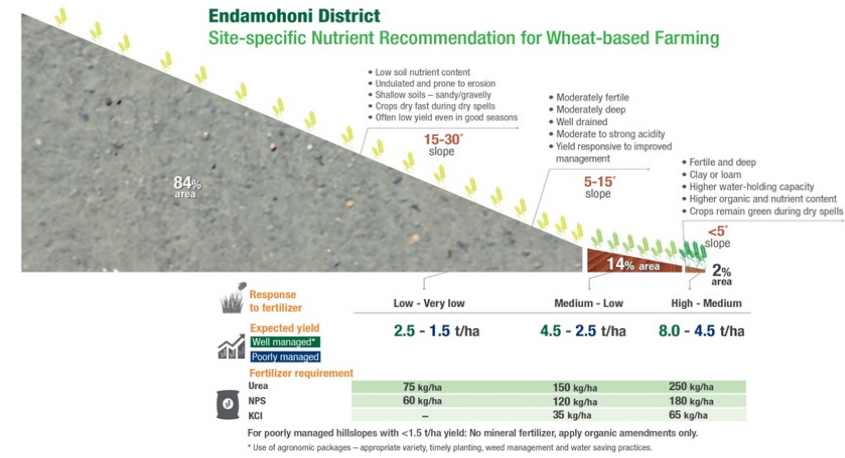
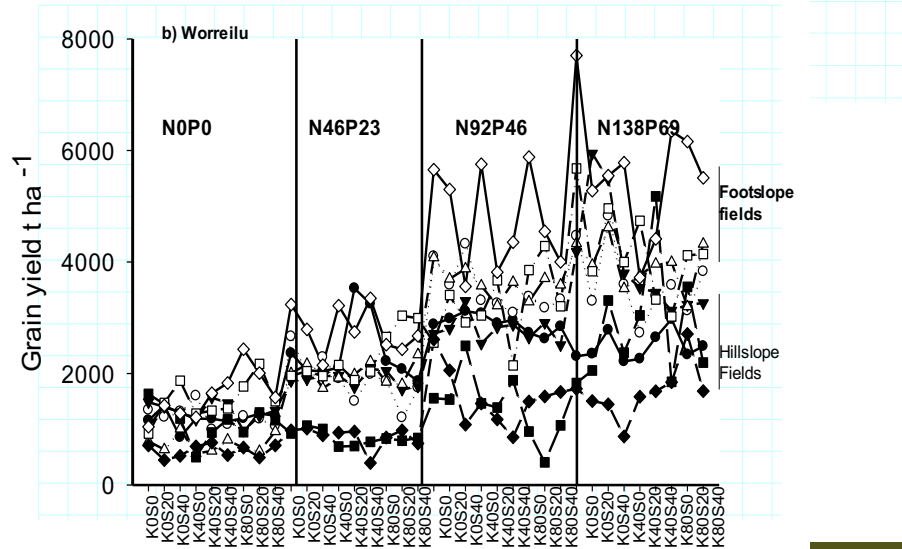
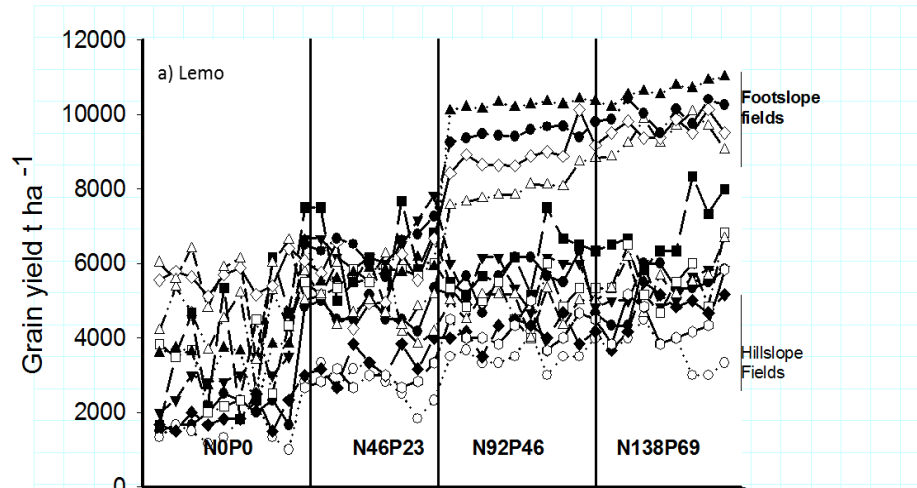
## Fertilizer prices

US\$/mt

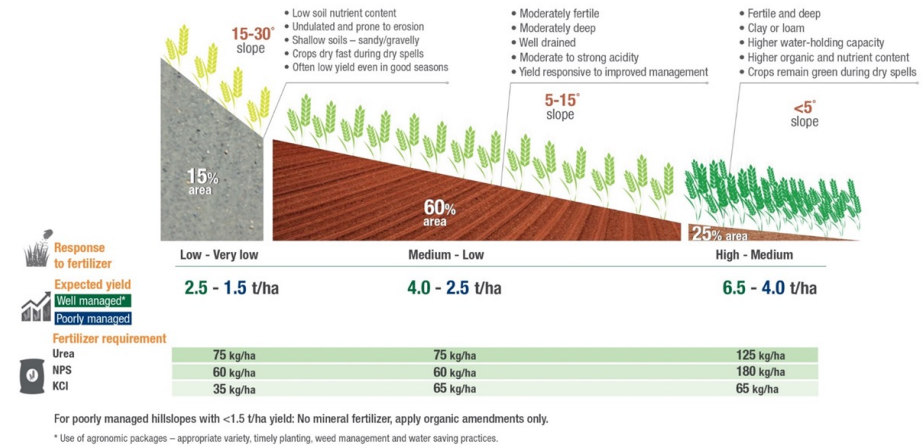
— DAP — Urea — MOP

Note: DAP = diammonium phosphate. MOP = muriate of potash. mt = metric ton. Last observation is December 2022.

Source: Bloomberg; World Bank. • [Embed this chart](#) • [Download image](#)



### Lemo District Site-specific Nutrient Recommendation for Wheat-based Farming



Crop response to fertilizer application increases from hills to flat, valley bottoms





**Crop yield response to fertilizer application in differing landscapes in Tigray, Amhara, Southern Regions of Ethiopia**

# Microdosing, a scalable ISFM technology



Microdosing : Applying a small amount of fertilizer (usually less than 15 kg/ha) in the planting pots  
Substantially increase production and save costs

***With the use of micro-dose technology, sorghum yield increased between 10 to 36%.***

***Marginal rate of return for microdosing showed that for each dollar invested the farmer would get 2 \$ in return in a good year and 1 \$ in a bad year.***

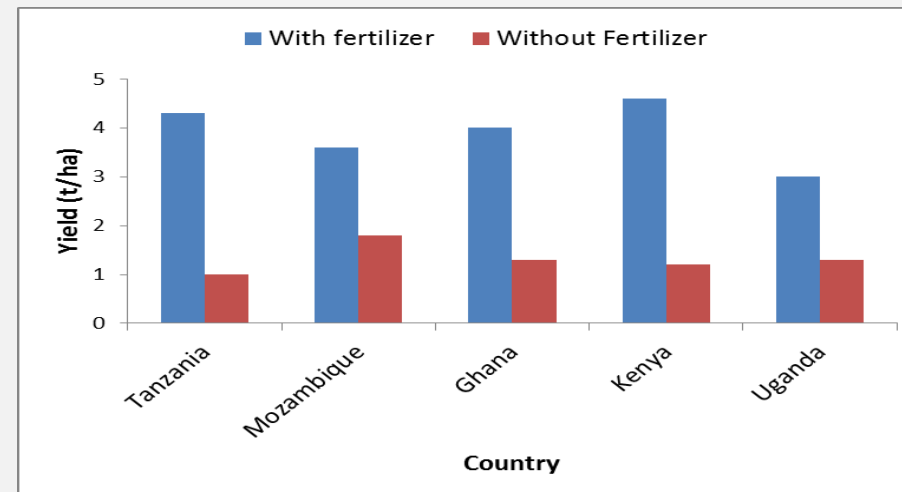


Figure: Effect of fertilizer use on maize grain yield across different countries

# How do we take it to scale in drought-prone farming?

What are the models in drylands (barley-based, sorghum-based, millet-based, agro-pastoral, early maturing maize..)..

sandy soils,  
low nutrient use efficiency,  
short growing season  
Alkaline / sodic soils

- What are the soil health solutions?
- Enhancing soil carbon
- Nitrogen and Phosphorus limiting
- Targeted fertilizer application
- Increasing nutrient use efficiency,
- Irrigation, alternative water source
- Drought resistant crops

# How do we take it to scale in high potential areas?

What are the models in high rainfall, high potential areas (Maize-based, Wheat-based, Root and Tubers; Agroforestry systems..).

Land degradation/  
erosion

Moisture non-limiting

Phosphorus fixation

Low N use efficiency,

Long growing season

Acidic soils (43%  
affected)

What are the soil health solutions?

- Enhancing soil carbon
- Phosphorus, K, Ca limiting
- Targeted fertilizer application
- Increasing nutrient use efficiency,
- Cover crops, intercropping
- Lime access and application



# Investment needs in soil health and fertilizer systems

- ✓ Access to diversified sources of fertilizers by expanding the Africa Fertilizer Financing Mechanism to improve production, procurement and distribution of organic and inorganic fertilizers
- ✓ Investment on Lime: Soil acidity dictates input use efficiency: production, distribution and reach
- ✓ Biofertilizers: inoculant centers, urban waste to farming
- ✓ Landscape restoration and regreening: strongly linked to soil health
- ✓ Increased access to rural, renewable energy: Save biomass for CC adaptation and soil health restoration
- ✓ Strengthening last mile delivery systems: farmer to extension ratio; VBAs; Agrodealership to reduce distance to market
- ✓ Build national capacity for locally relevant fertilizer and soil health technologies
- ✓ Policy : fertilizer subsidies , regional regulatory framework



Thank you!