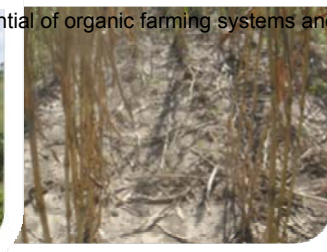




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SOC sequestration in farming systems in Africa: Potential, opportunities and challenges

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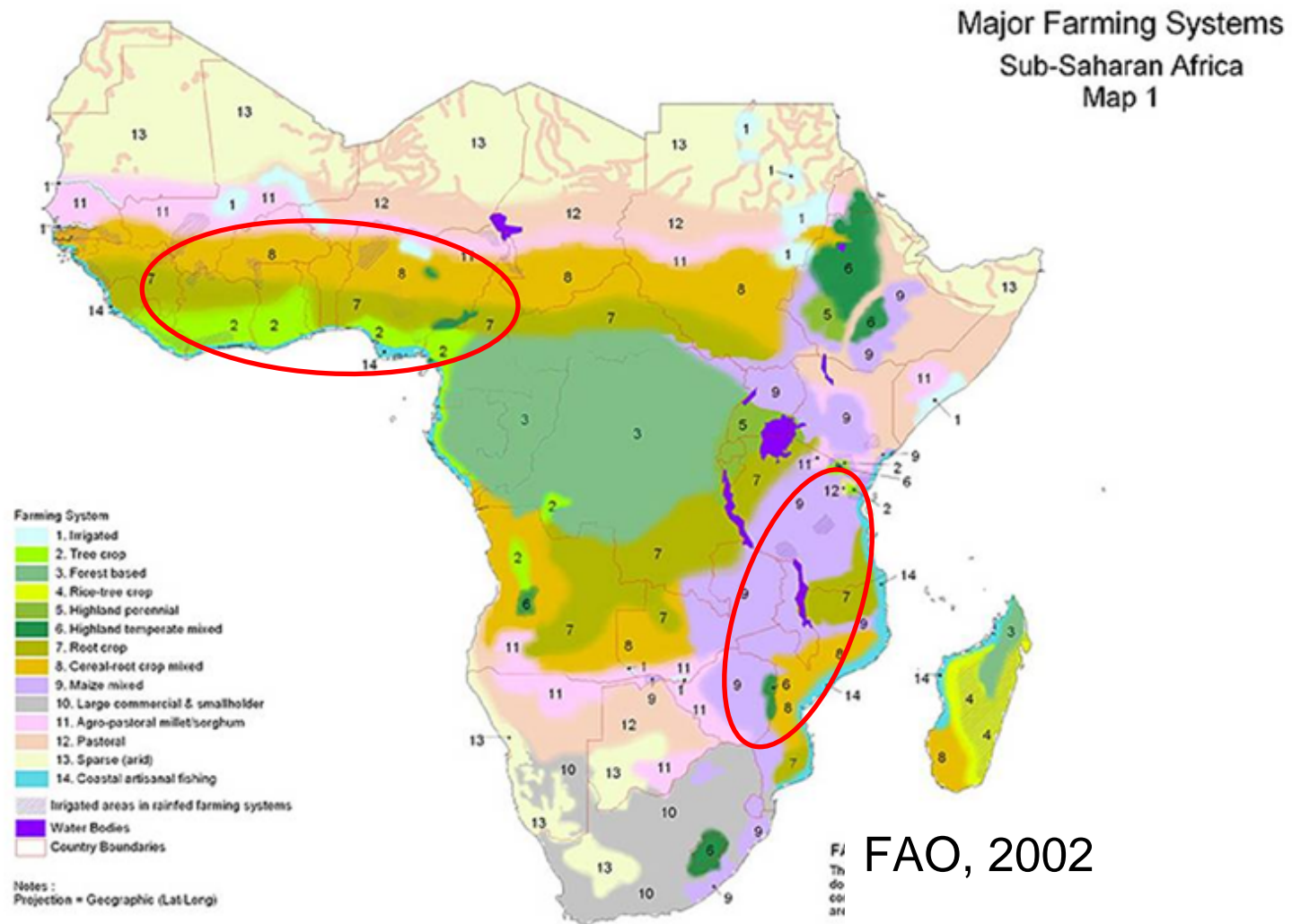
Condition for farmers in SSA

- Depend strongly on recycling of organic matter, but very limited availability
- Limited labor availability
- Relatively small, fragmented farms
- Rain-fed farming
- Soil are predominantly inherently infertile
 - Highly weathered
 - Vast areas under fragile sandy soils

Condition for farmers in SSA

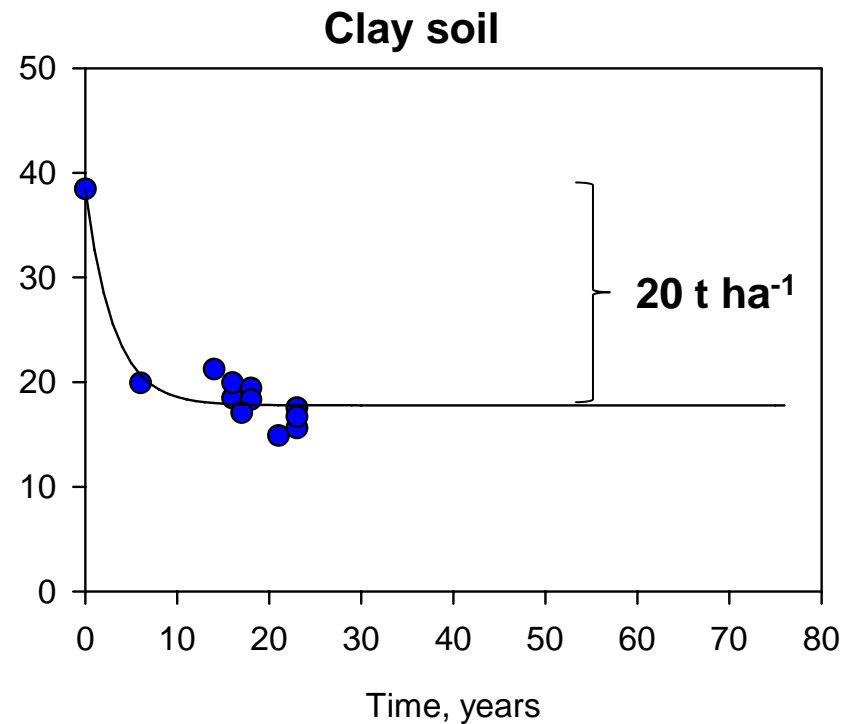
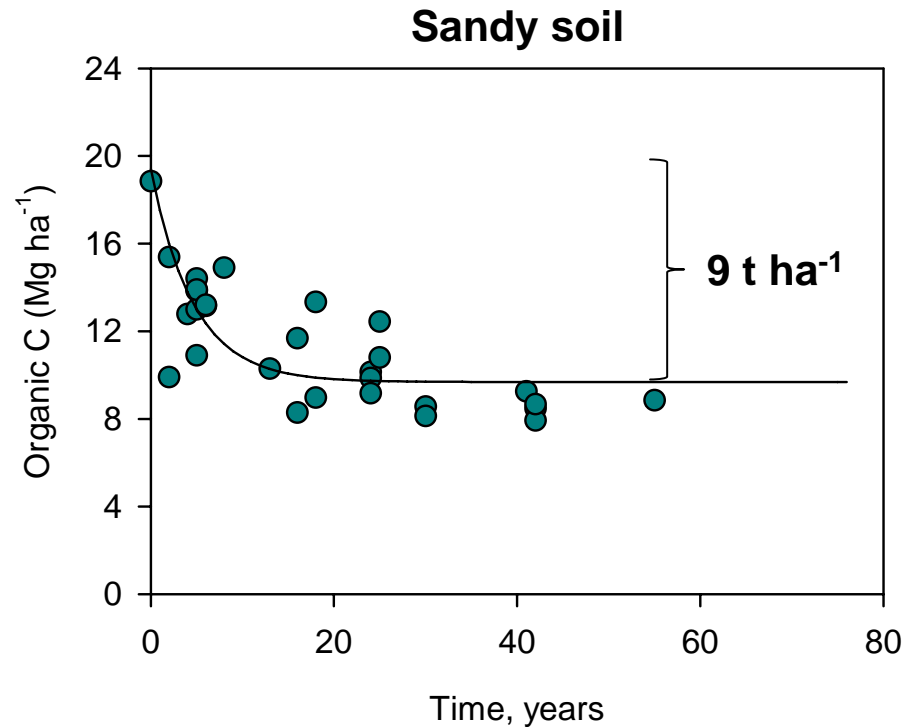
- Constraining socio-economic environment
 - Rapid population growth (PD up to 700)
 - Poor infrastructure
 - Poor market access
 - Poor access to information
 - Land tenure problems

Overview of farming systems in Africa



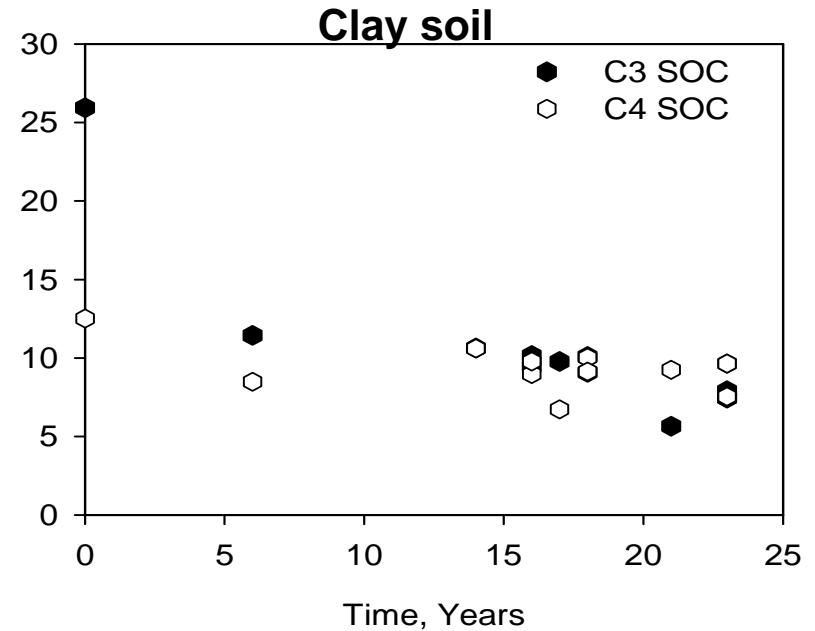
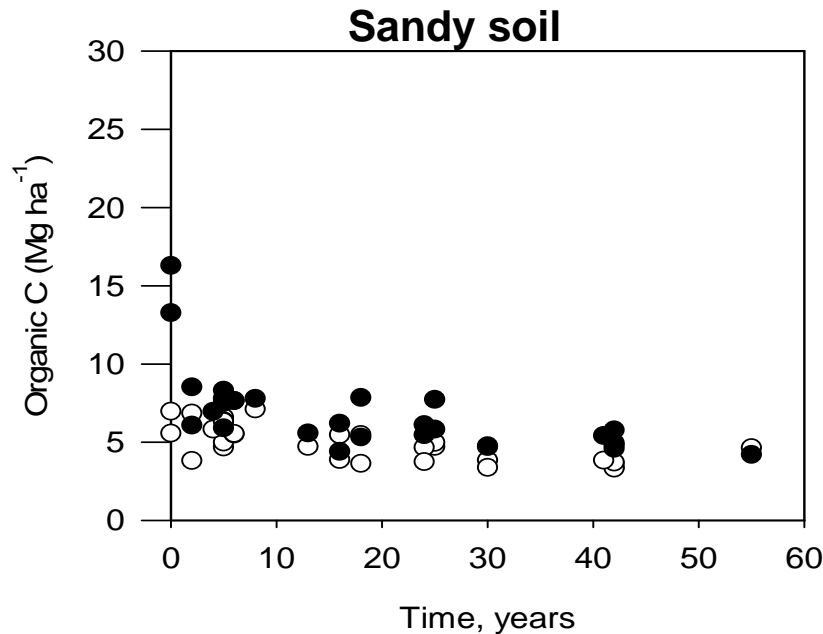
Good potential zones

SOC dynamics



- ✓ Rapid decline in SOC with little organic inputs
- ✓ Greater potential to sequester C in clay soil

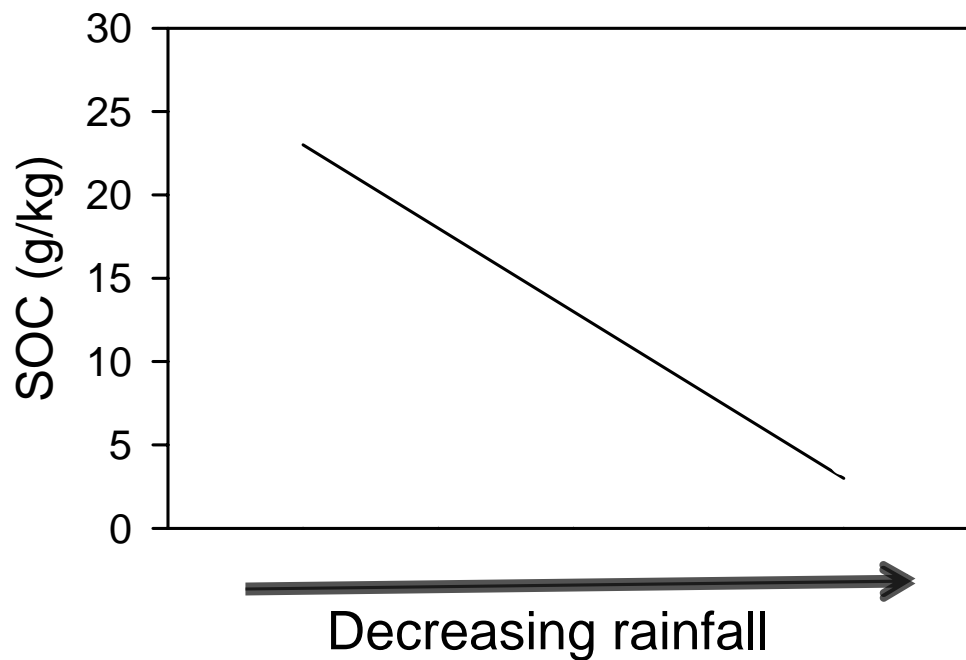
SOC dynamics



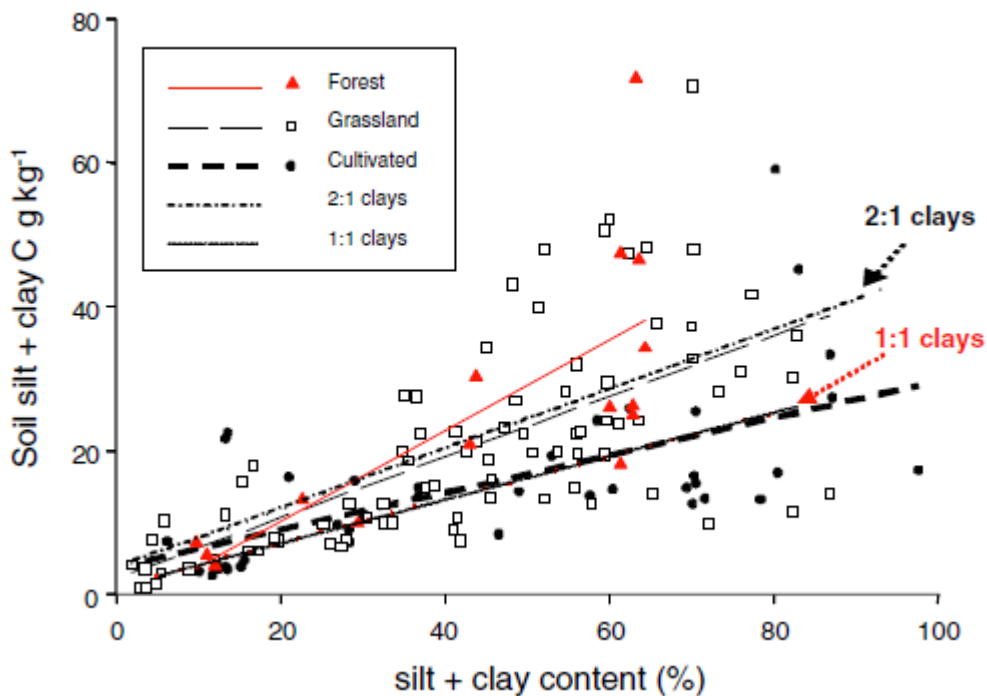
- ✓ Cropping system contributes little to SOC
- ✓ Part of the original C persistent

SOC stocks

Soil organic carbon	World	Africa
SOC stocks (Pg C)	1462–1548	170–180
SOC density (kg C m ⁻²)	10·9–11·6	6·4–6·7

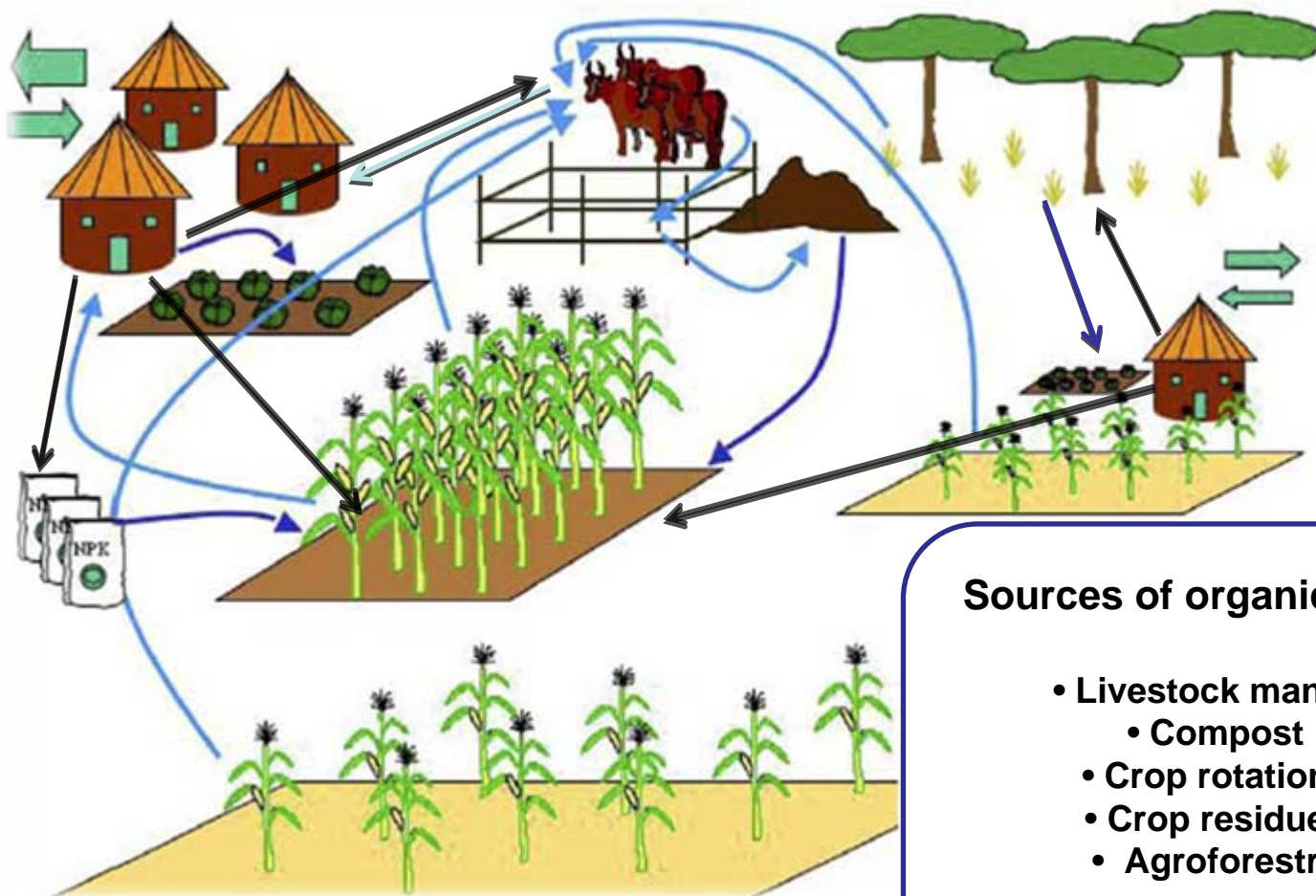


SOC stocks



Particle size distribution, mineralogy and land-use

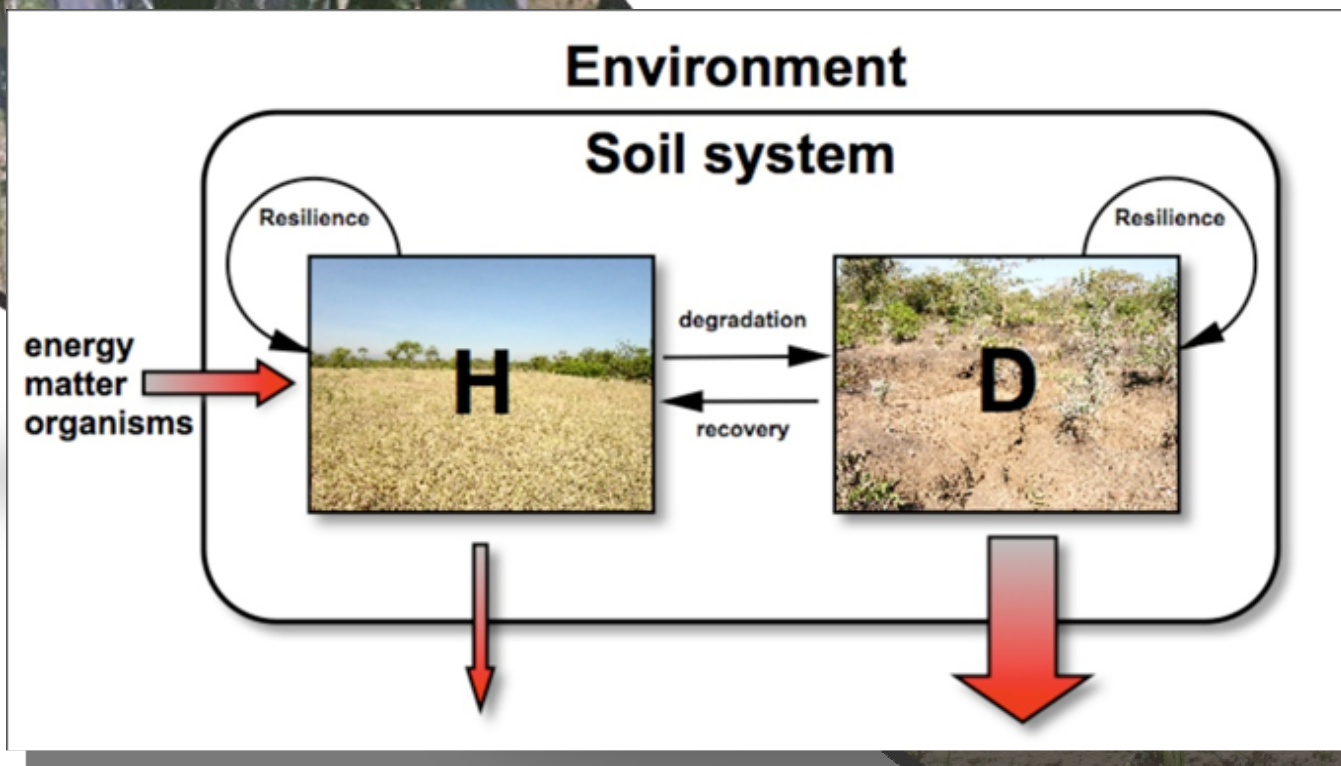
Complex heterogeneity within farming systems



Land degradation



Land degradation



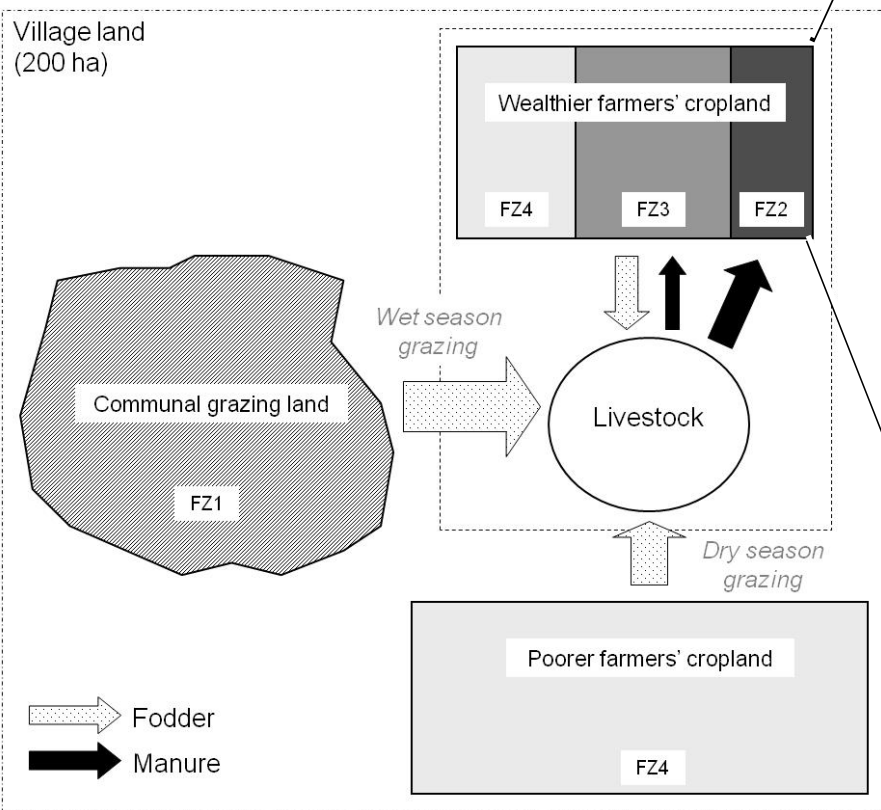
C sequestration options

- No 'silver bullets'
- System and farm type specific
 - Access to resources
 - Labour
 - Gender
- Immediate benefits
- Low risk

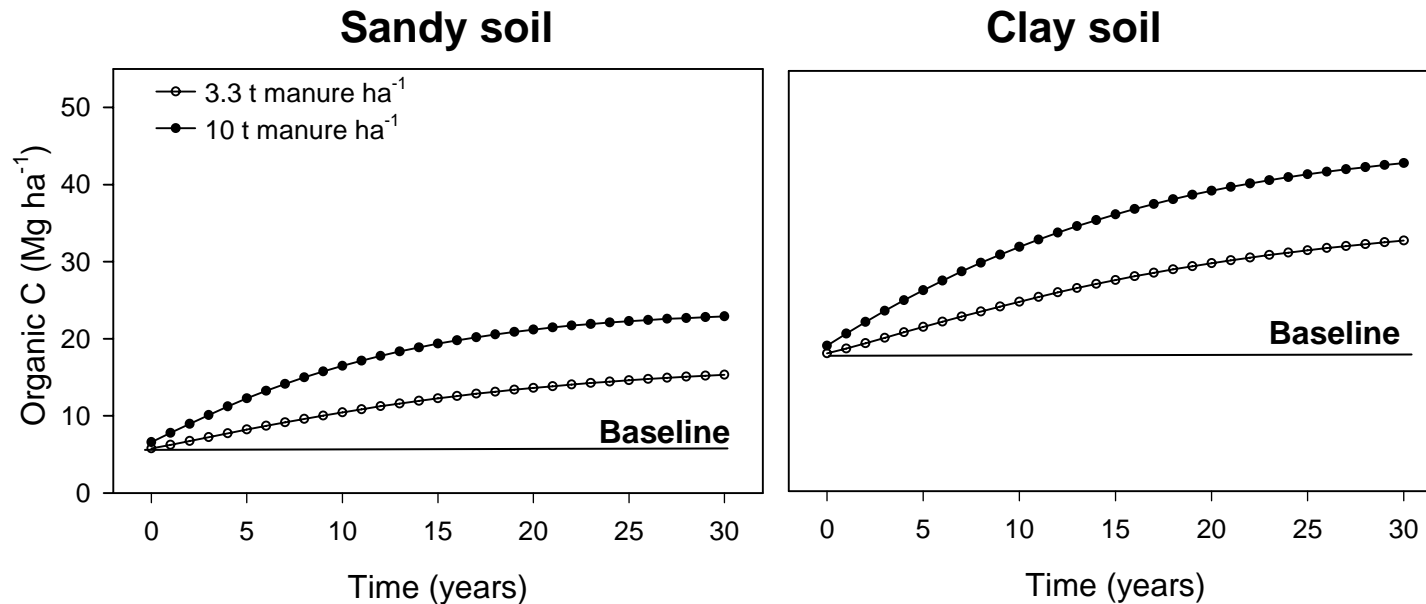
Feasibility and impact of various options

	Feasibility	Potential C gain
Non degraded soil		
Reduced tillage	H	M/L
Cereal crop residues	M	M/L
Manure	M	M/H
Compost	H	L
Grain legumes (intercrops/rotation)	H	M
Agroforestry/cover crops	L/M	M/H
Natural fallow	L	L
Water conservation	M	M
Degraded soils		
Reduced tillage	H	L
Cereal crop residues	L	M/L
Manure	L	M/H
Compost	L	L
Grain legumes (intercrops/rotation)	M	M
Agroforestry/cover crops	M/H	M/H
Natural fallow	M	M

Community level



Livestock manure



- Effective at SOC sequestration
- Limited quantities
- High labour demand
- High grazeland:cropland ratio required

Crop rotation – grain legume



- Attractive for nutrition and income, soil N
- High N harvest indices
- Fast decomposing
- Fail to perform in poor soils



Cereal crop residues

- Potentially high availability
- Many competing uses
- N immobilization
- Pest and diseases problems



Most effective when combined
with reduced tillage

Agroforestry / cover crops



- Multiple benefits
- Long-term investment
- Competition for labour
- Fail to perform in poor soils/low rainfall areas

Potential C sequestration niche for Organic Farming in Africa

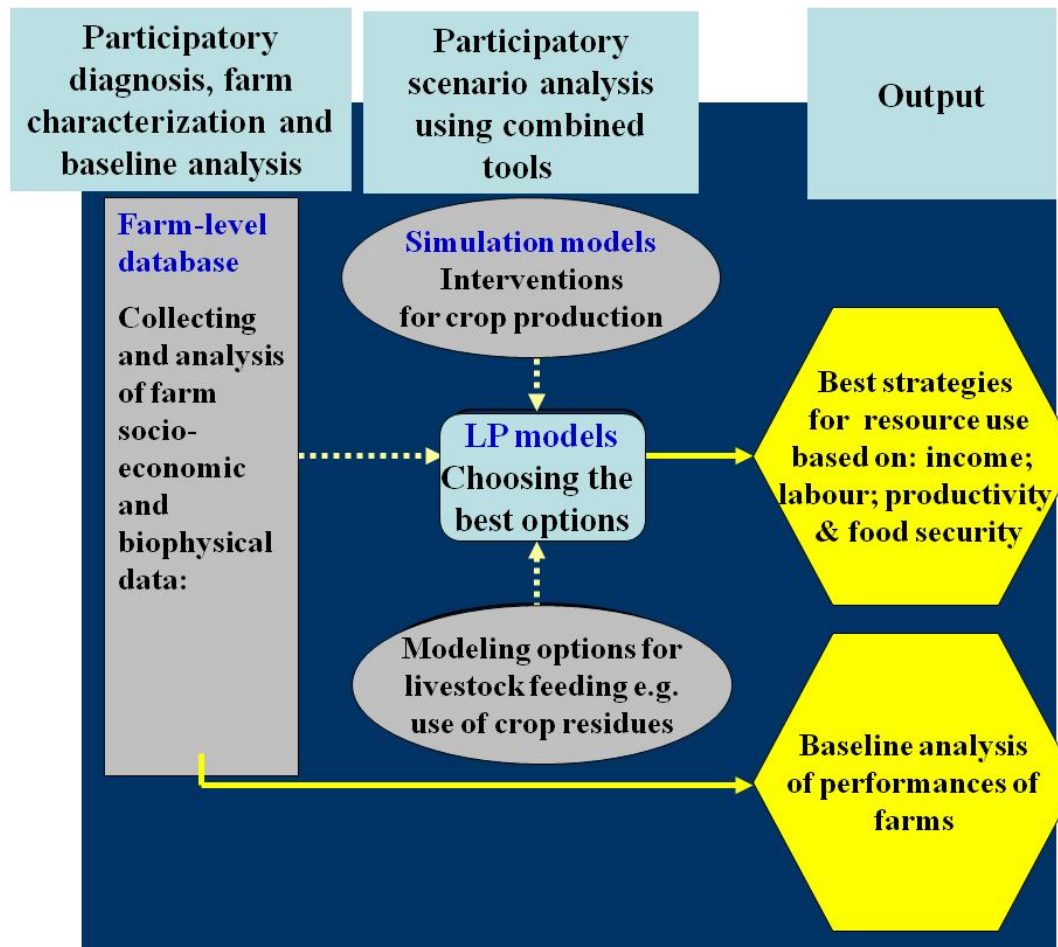
- High SOC deficits
- Favorable environments
 - Medium-high rainfall
 - More fertile soils
- Areas with good access to markets
- Enabling policy environments

Dealing with the complexity

- Understanding of farmer reality, socio-economic and biophysical heterogeneity necessary
- Promote flexible, farmer-friendly, market oriented technologies
- Promote local adaptability

Dealing with the complexity – Integrated Analysis of smallholder farming systems

Decision support tools



Concluding Remarks

Dealing with the complexity

- Understanding of farmer reality, socio-economic and biophysical heterogeneity necessary
- Promote flexible, farmer-friendly, market oriented technologies
- Promote local adaptability

Thank you