Conservation Agriculture and Ecosystem Services

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Outline

- Characteristics of conservation agriculture (CA)
- Impacts of CA
- What are ecosystem services?
- Potential ecosystem services impacts of CA

Characteristics of CA

- year-round organic soil cover
- reduced tillage
- crop rotation systems
- integrated pest management
- integrated nutrient management

More closely mimic natural vegetative systems than conventional industrial agriculture.

For SANREM, we are not limiting to organic farming and no-till.

CA with Cassava and Maize

Source: African Conservation Tillage Network photo library

Impacts of CA

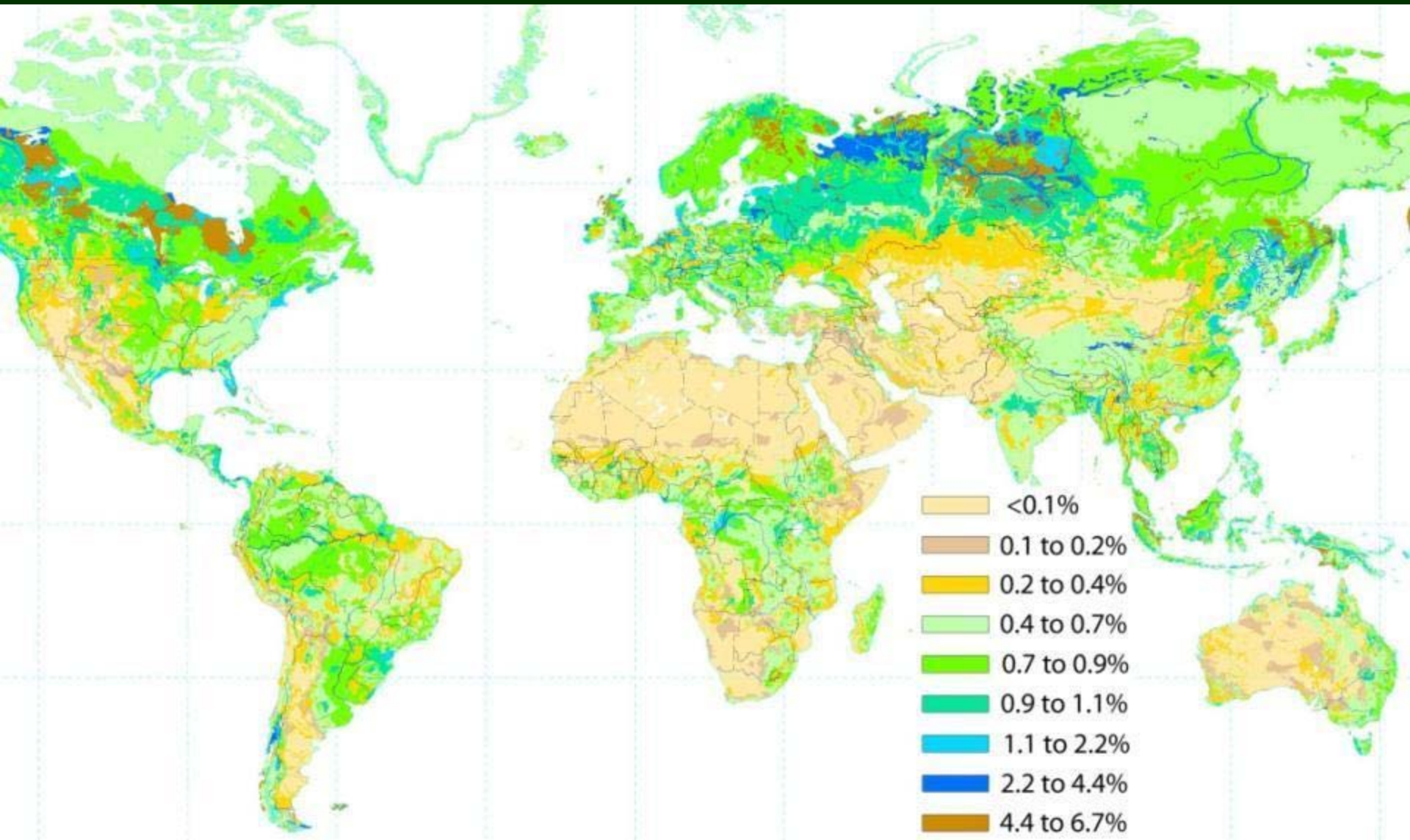
- Increased soil carbon (until equilibrium)
- Reduced erosion (<T)
- Enhanced soil fertility and structure
- Increased soil biodiversity
- Increased infiltration and soil moisture storage
- Improved response to agronomic inputs

Description: Using a creeping vetch as a living mulch through which maize was planted resulted in marked changes in soil color, N-content maize yield and year round protection of the soil surface (FAO Soils Bulletin 75).

Conservation agriculture versus conventional tillage wheat root systems
(FAO Soils Bulletin 75)

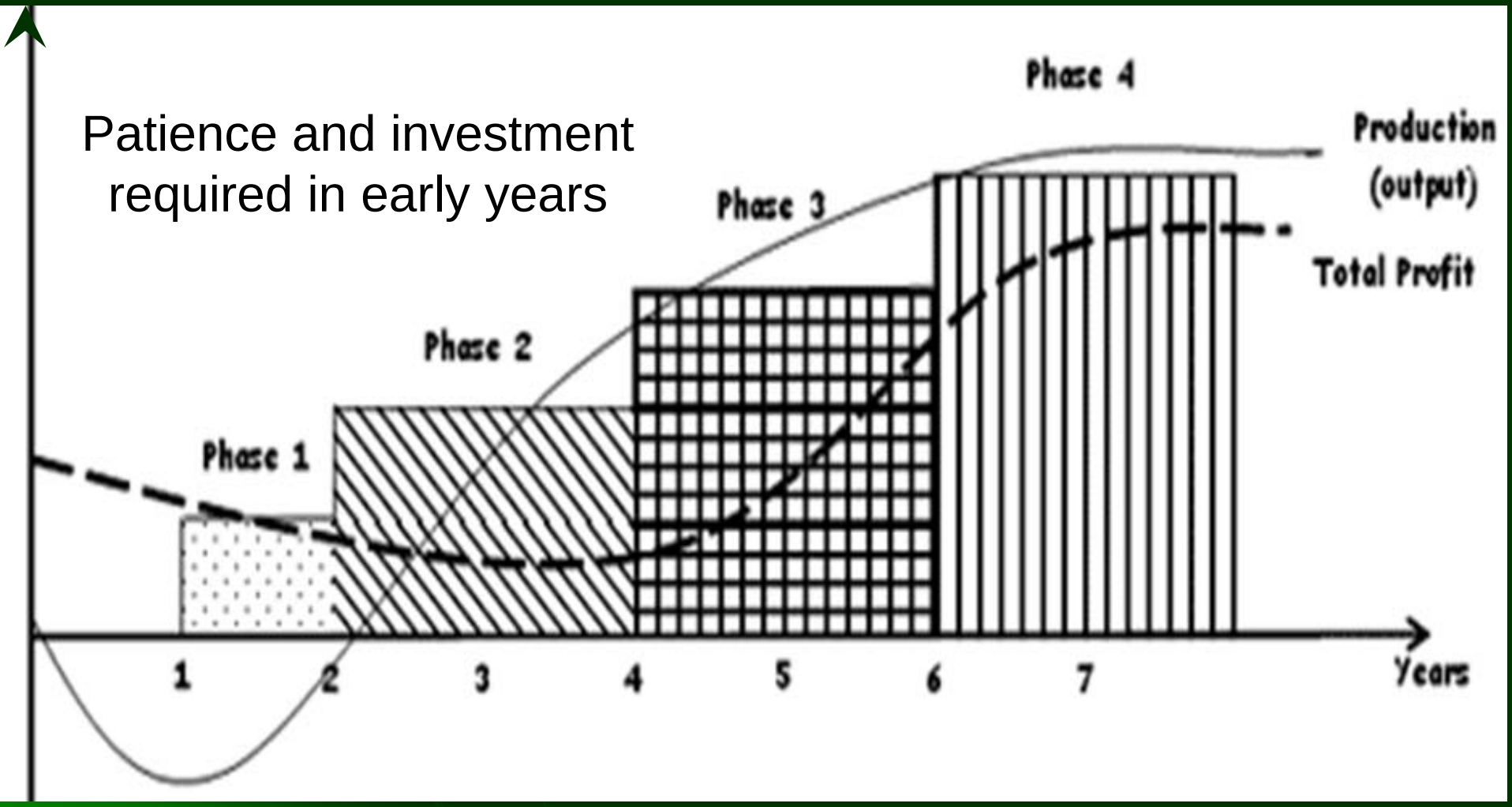
Global Soil Organic Carbon, %

Source: FAO-UNESCO, Soil Map of the World, Sept. 2000; top 1 meter



Potential increase in production and profits

Patience and investment required in early years



What are ecosystem services?

- Ecosystem services are the benefits that humans *(and other species)* obtain from functioning ecosystems. They have an estimated value of $16-54 trillion/yr.
  - Provisioning
  - Regulating
  - Supporting
  - Cultural

Ecosystem Services

- *Provisioning services*
  - food (cultivated and wild plants & animals)
  - water
  - oxygen
  - fiber
  - genetic resources
  - energy (hydropower, biomass fuels)
  - **biochemicals**

Ecosystem Services

- *Regulating services*
  - carbon sequestration
  - climate and weather regulation
  - waste decomposition and detoxification
  - water and air purification
  - erosion control
  - crop pollination
  - pest and disease control
  - drought, floods, UV radiation control

Ecosystem Services

- *Supporting services*
  - nutrient dispersal and cycling
  - seed dispersal
  - primary production
- *Cultural services*
  - Cultural and spiritual inspiration
  - recreation

Which ecosystem services are likely to benefit from conservation agriculture?

Ecosystem Services

- *Provisioning services*
  - food (cultivated plants & animals)
  - water – generally positive but if water used more productively in upland areas, could decrease downstream availability
  - oxygen
  - energy (hydropower, biomass fuels) ?

Ecosystem Services

Regulating services

- carbon sequestration
- climate and weather regulation
- waste decomposition and detoxification
- water and air purification
- pest and disease control ?
- drought & flood risk
- Erosion control

UV radiation

Maize growing through Mucuna cover crop

Ecosystem Services

- *Supporting services*
  - nutrient dispersal and cycling ↑
  - primary production ↑
- *Cultural services*
  - recreation ↑

Summary and Conclusions

- CA is environmentally and agronomically sound.
- Adoption is increasing on large mechanized farms across the world.
- Potential for carbon sequestration payments in early years to offset initial challenges.
- Real challenge is adoption by smallholders.