2015

International Year of Soils

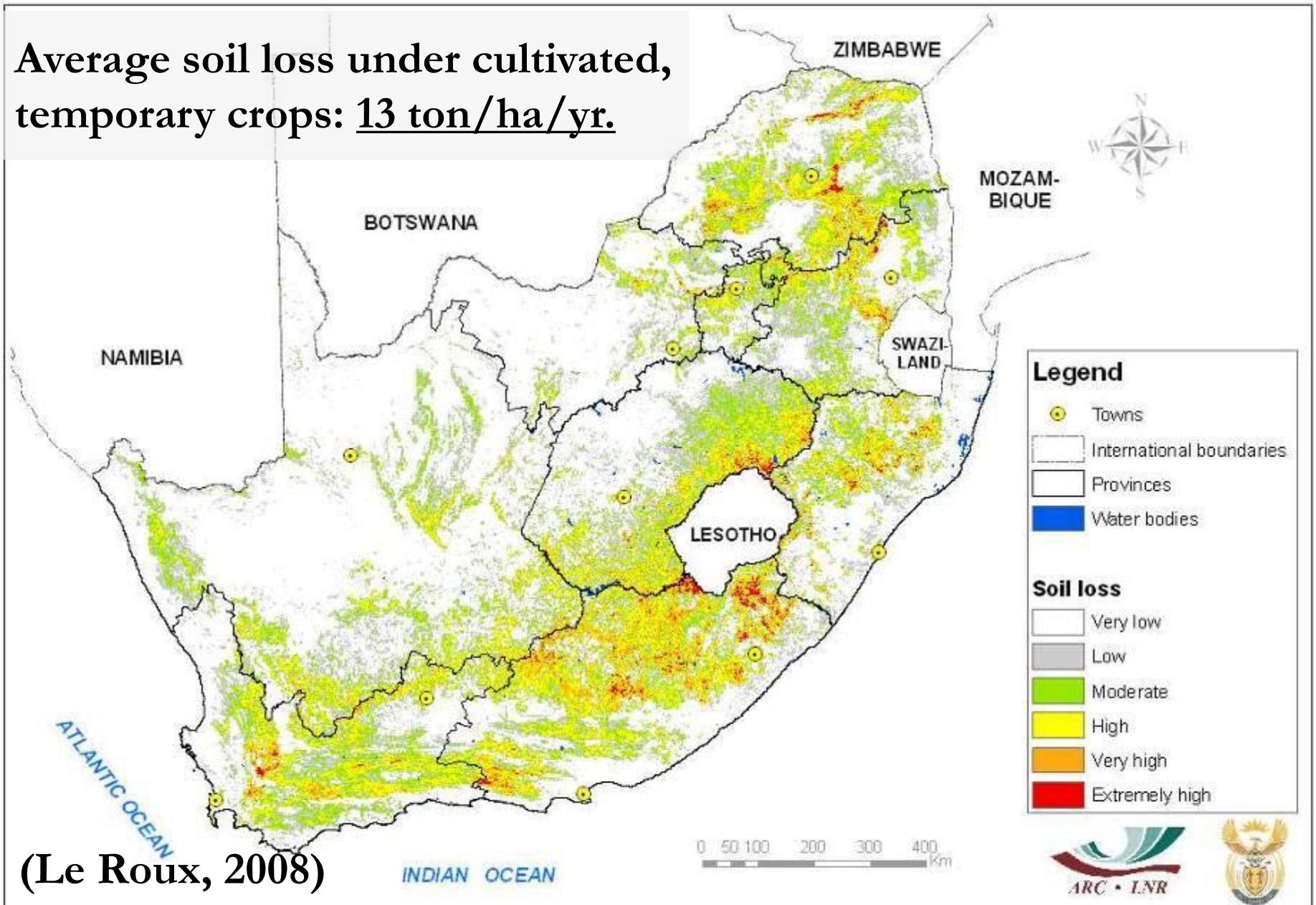
‘Dust Bowl’ USA, 1930’s

Free State, 16 Oct 2014

Johannesburg, 16 Oct 2014

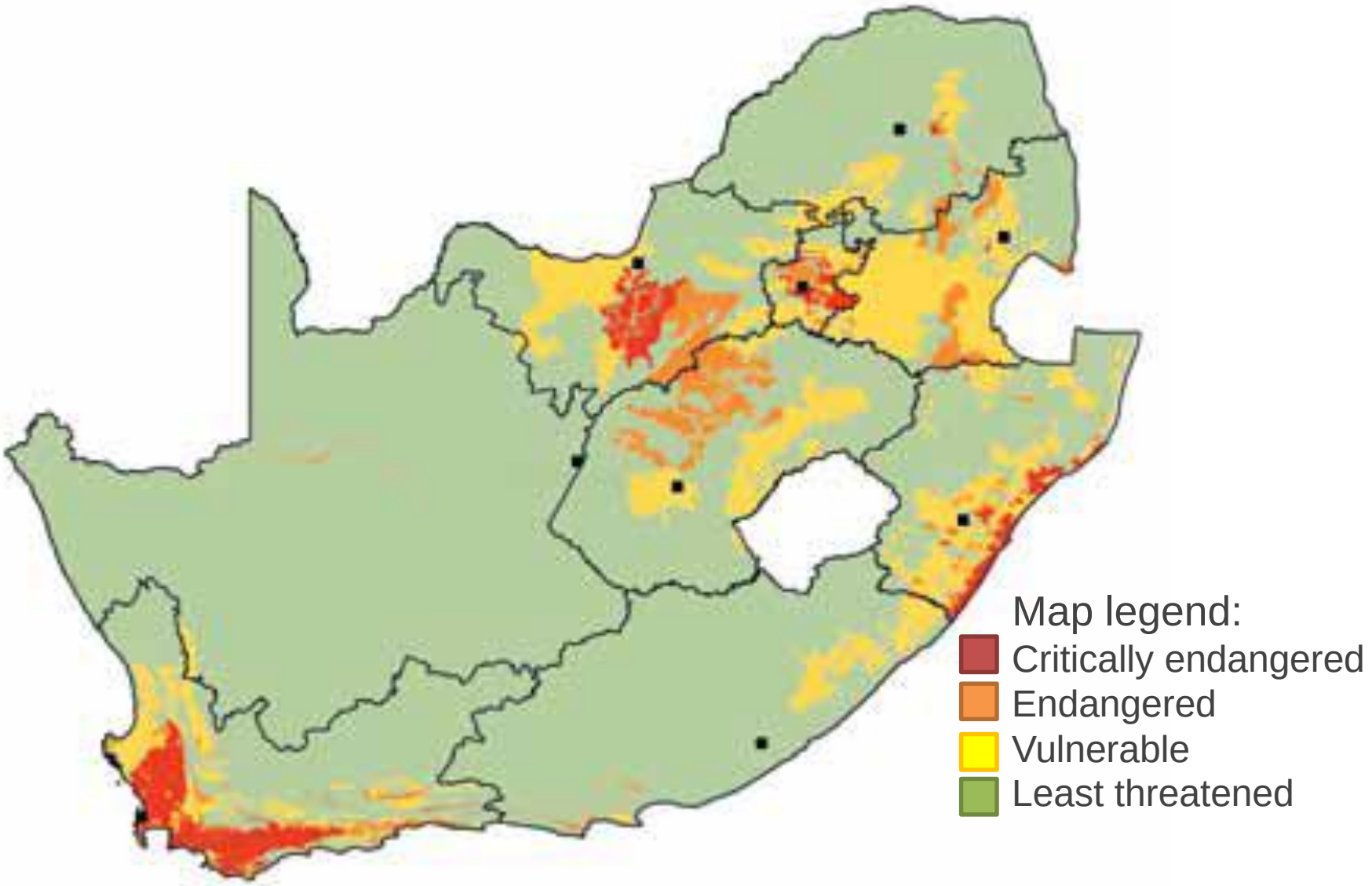
If Creation is sick, we are sick!
When it was created it was good.

Actual Water Erosion Rate in South Africa



(Le Roux, 2008)

The State of South Africa's Biodiversity (SANBI, 2013)



Climate Change

"…fixing carbon in soils is one of the few practical means we currently have to actually reduce global atmospheric CO2 levels. Building up soil organic matter is a win–win situation for the fight against climate change as well as soil health and crop yields, and must become the focus of farmers everywhere"

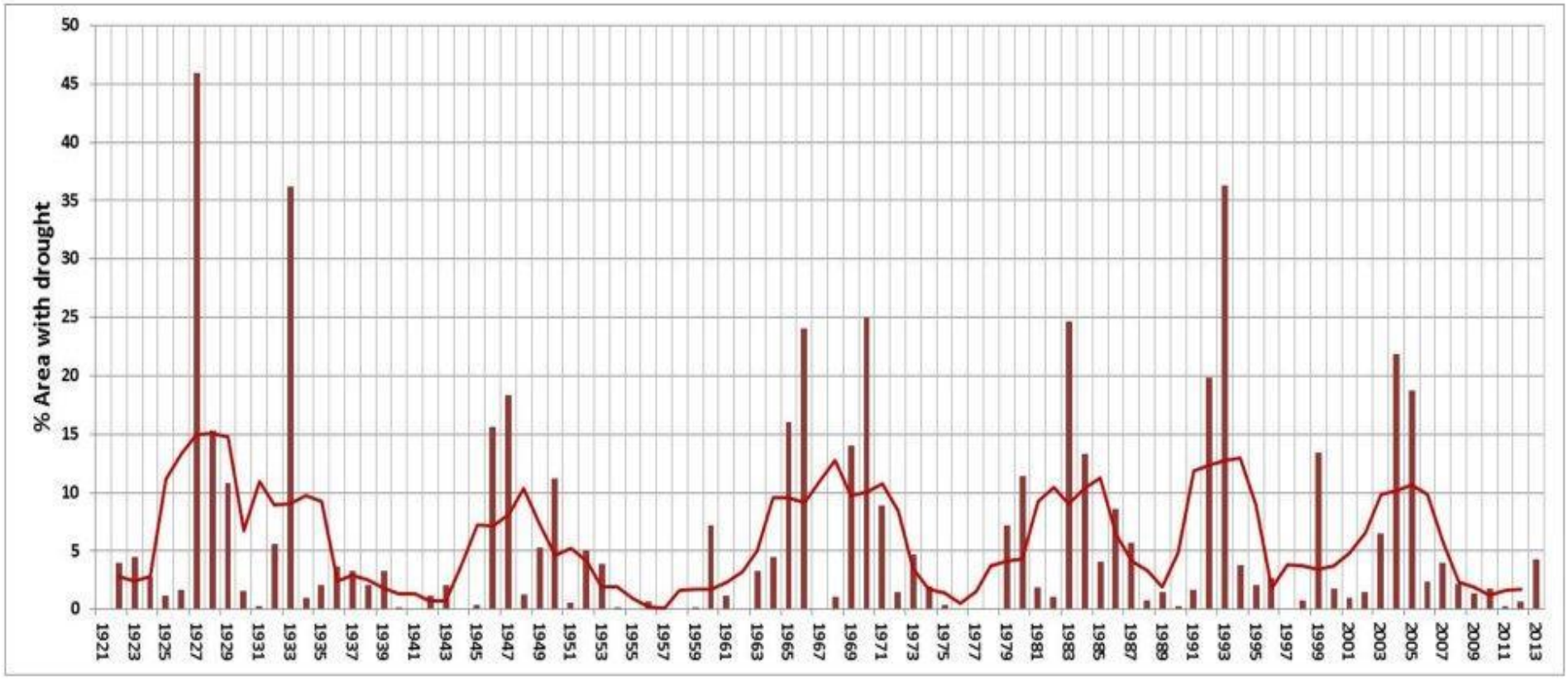
Rattal Lal

what we do as a society, in the next 5 years, will likely resonate for all life on earth over the next 10 000 years

Climate Change: Frequency and severity of droughts in SA

Severe drought:

24-month SPI— June

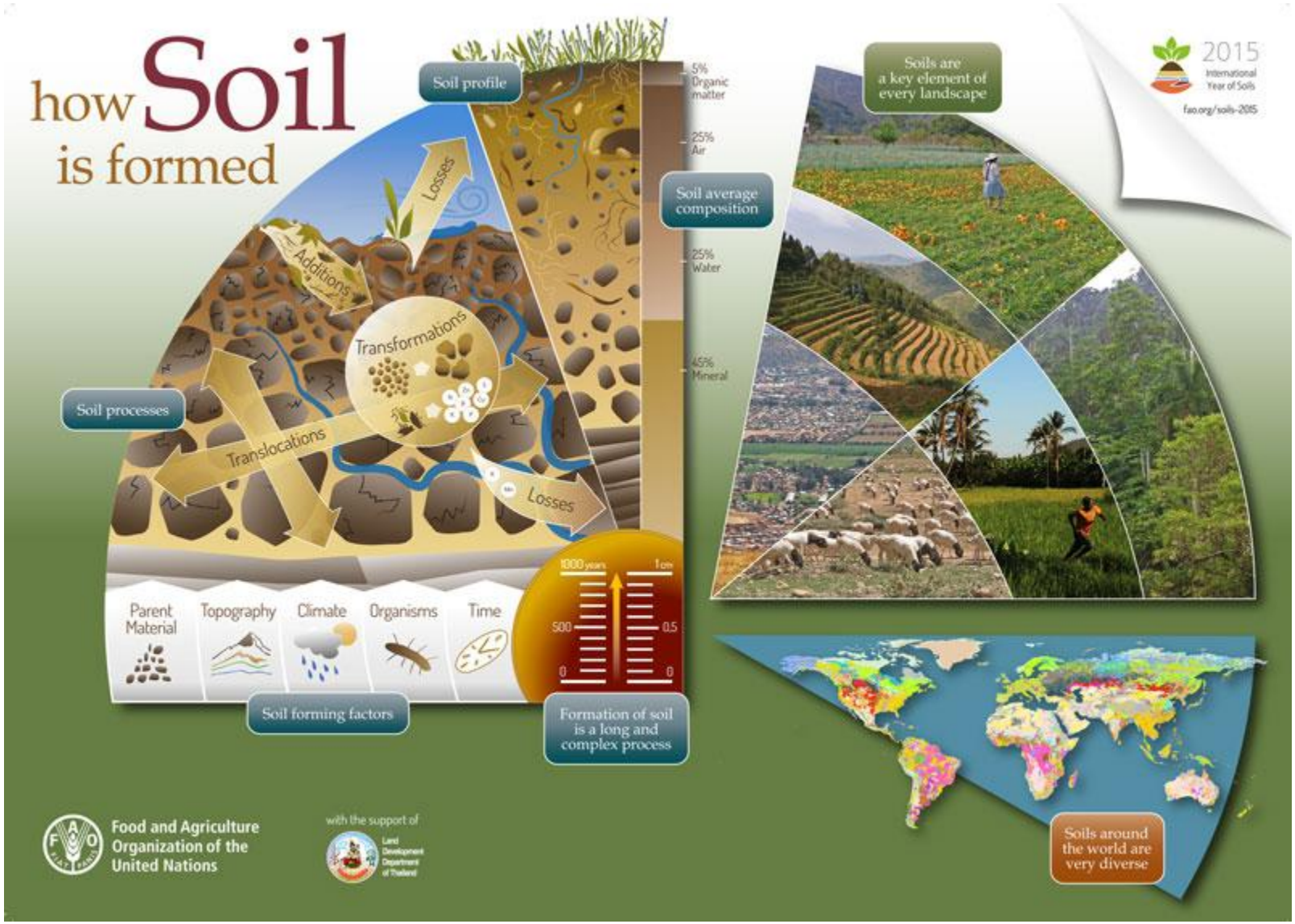


Malherbe, 2014

Food and Agriculture Organization
of the United Nations

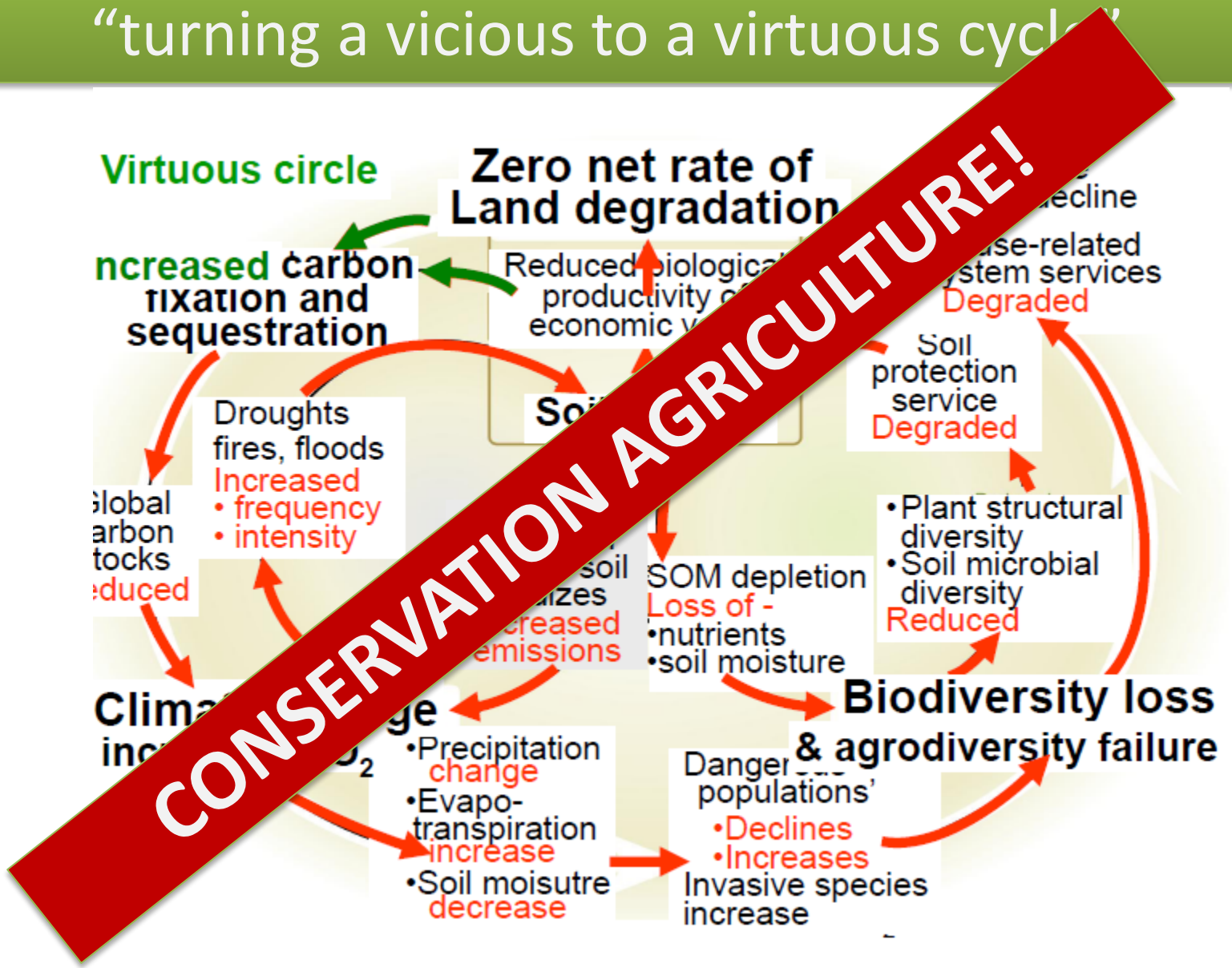
2015
International
Year of Soils

www.fao.org/soils-2015


how Soil is formed
Soil profile
5% Organic matter
25% Air
Soil average composition
25% Water
45% Mineral
Losses
Additions
Transformations
Soil processes
Translocations
Losses
Parent Material
Topography
Climate
Organisms
Time
Soil forming factors
1000 years
1 cm
500
0.5
0
0
Formation of soil is a long and complex process
Soils are a key element of every landscape
2015 International Year of Soils
fao.org/soils-2015
Soils around the world are very diverse
Food and Agriculture Organization of the United Nations
with the support of
Land Development Department of Thailand

Land degradation

"turning a vicious to a virtuous cycle"

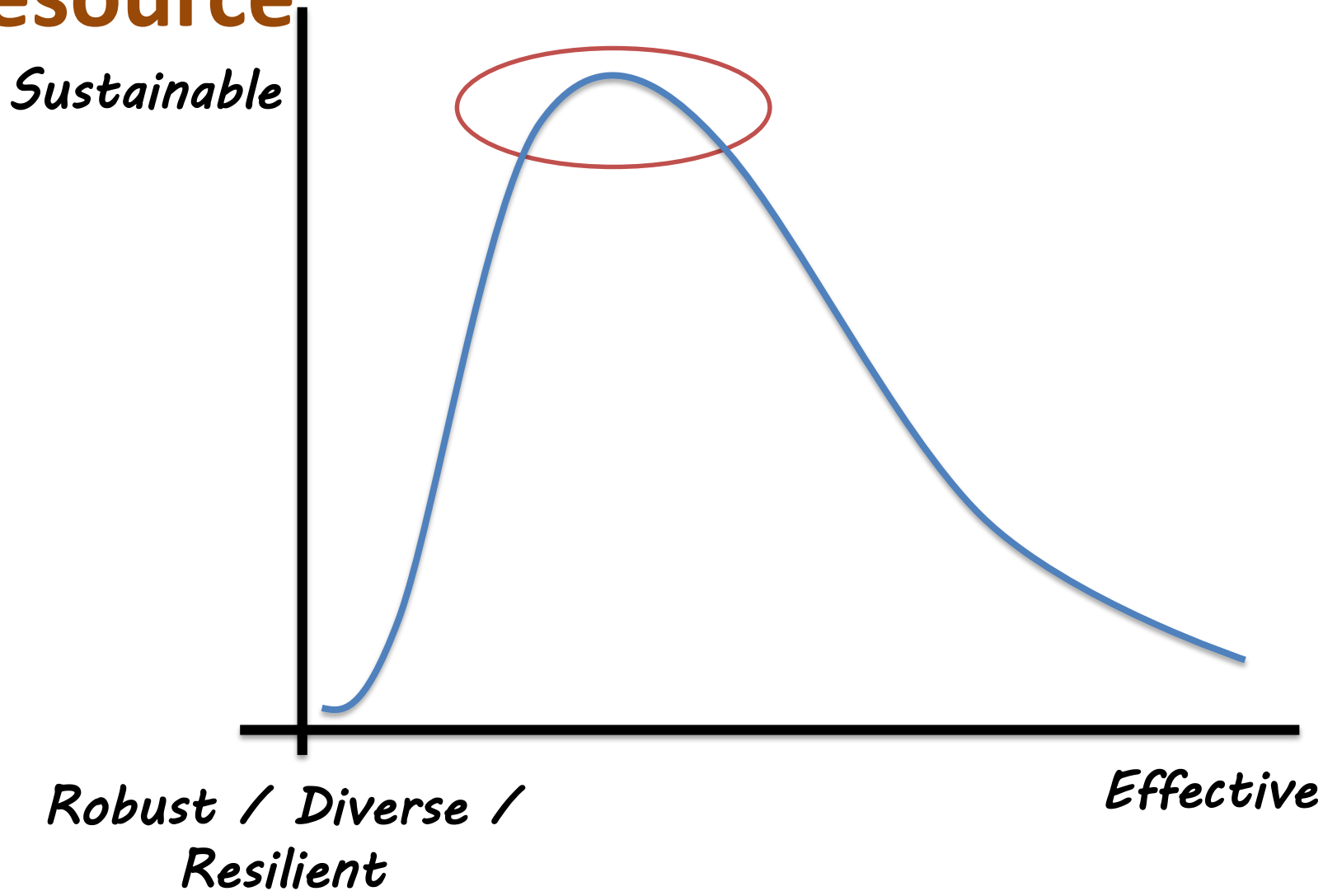


Conservation Agriculture

- Minimum mechanical soil disturbance
- Crop diversification
  - Including cover crops
- Permanent organic soil cover – Mulching (FAO)
- Integrated soil fertility and acidity management
- Integrated weed management
- Integrated pest and disease management
- Integration of animals

The Maize Trust

Sustainability of a degraded resource



95 per cent of terrestrial diversity is within the soil itself

Soil Health:
The continued capacity of the soil to function as a vital living ecosystem that sustains plants, animals and humans.
Soil Renaissance Plan, USDA

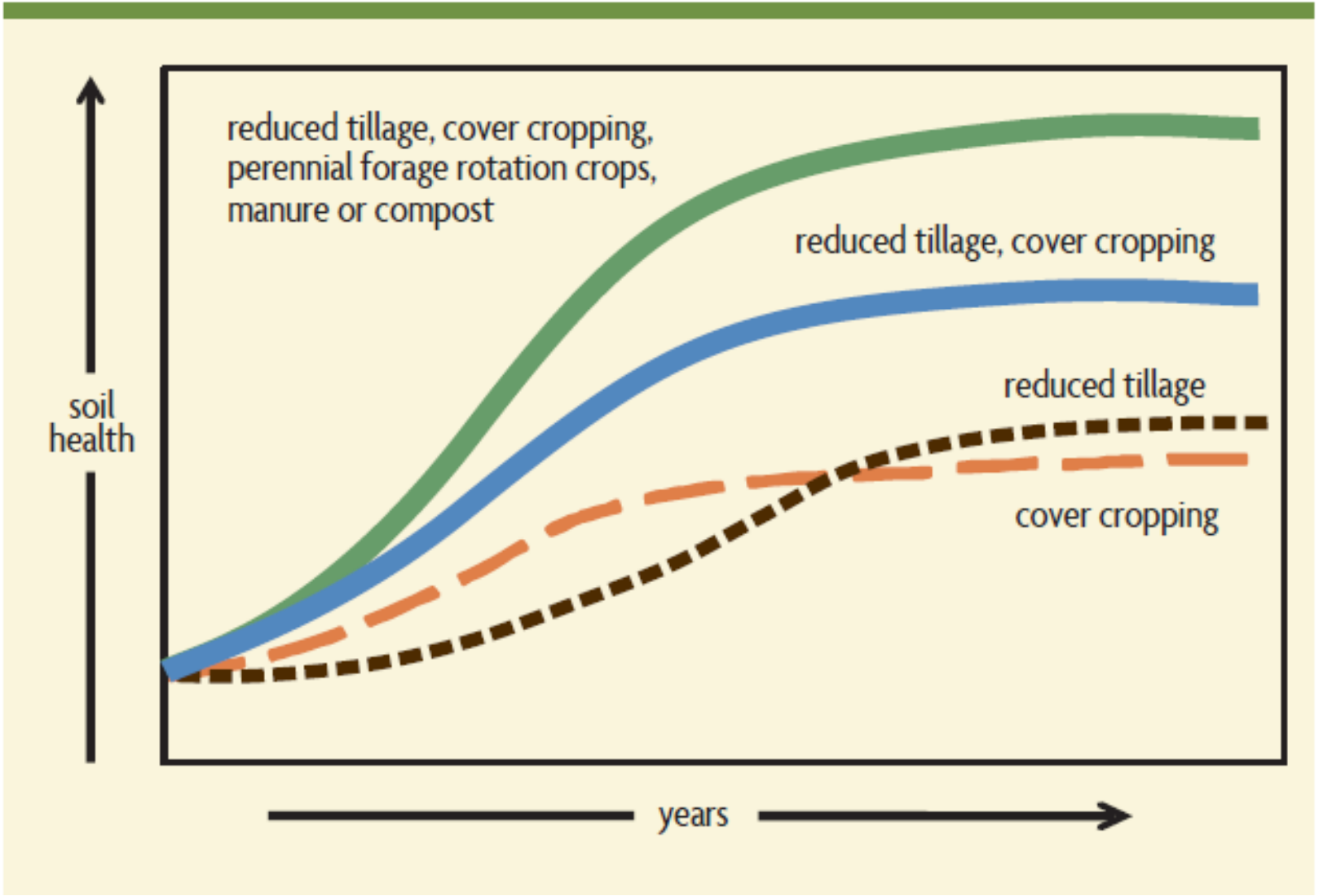
Soil Health and Fertility

- Soil is the heart of sustainable agric – ‘take care of the land and the land will take care of you’ – *Hugh Hammond Bennett, 1950*

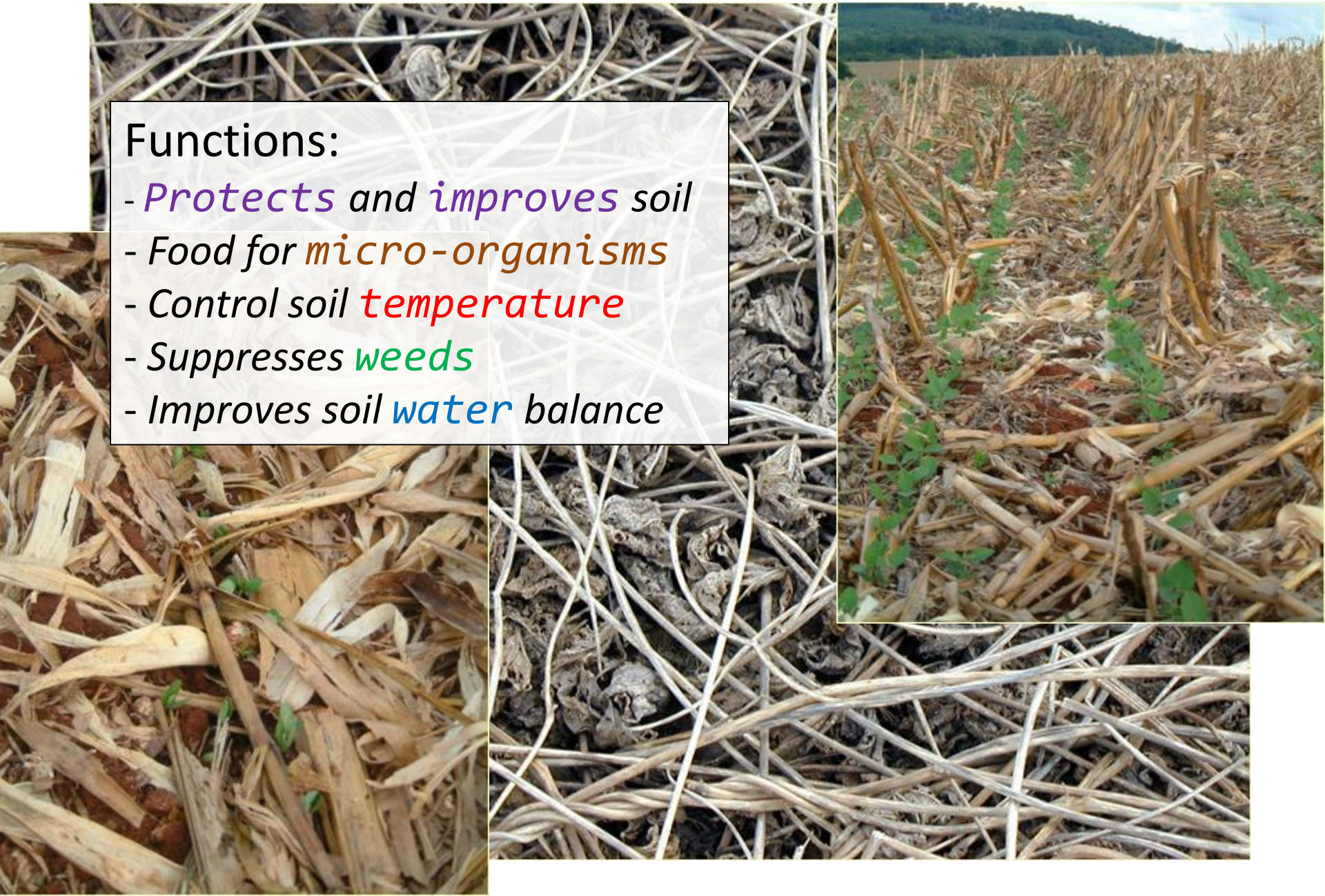
Effects of Soil Organic Matter

- Improves soil biology
- Increase water holding capacity
- Improves soil fertility (cation exchange capacity)
- improves soil structure
  - provides crumb structure that resists compaction
- decreases bulk density
- increases pore space
- increases oxygen diffusion rate

Combining practices that promote soil health has an additive effect



Permanent organic soil cover



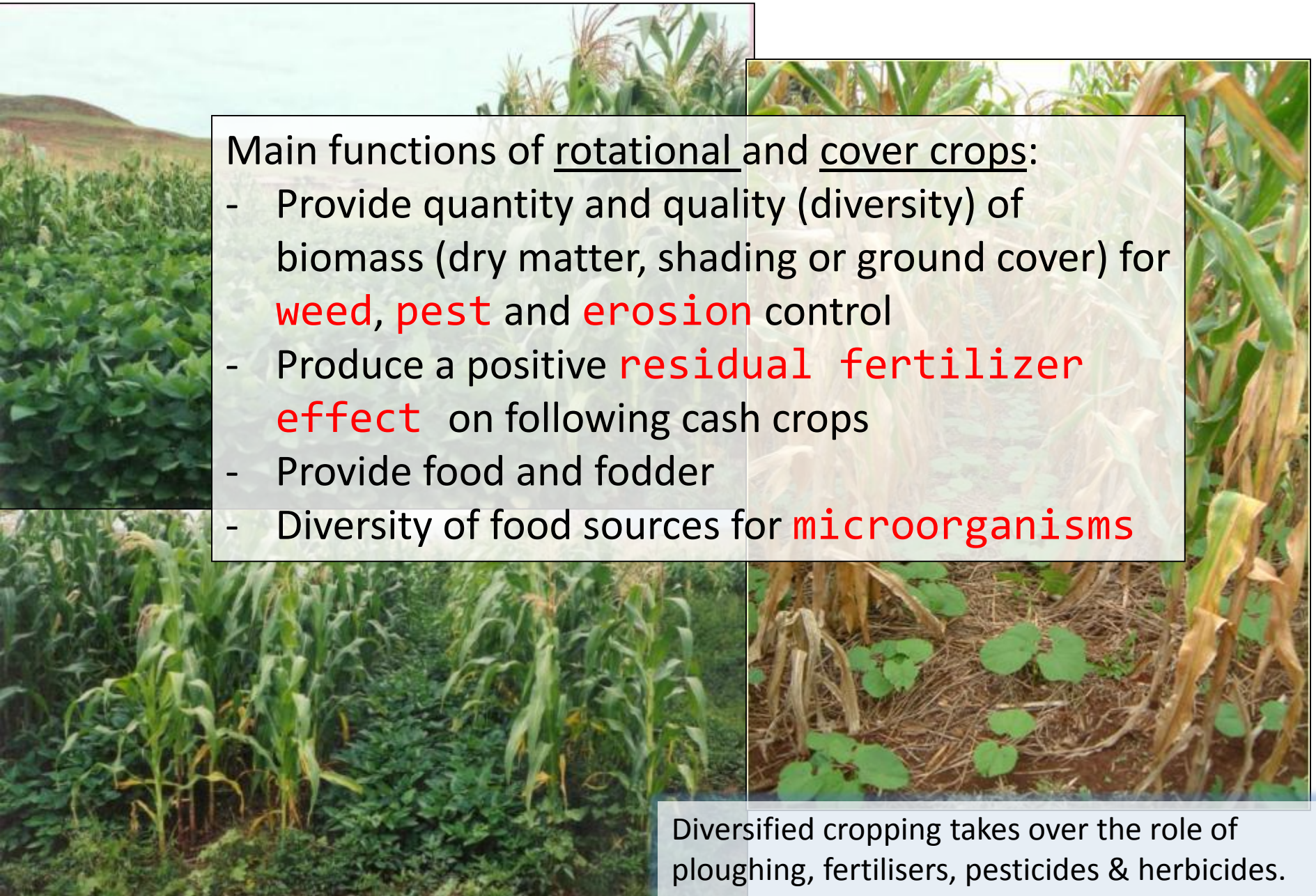
Functions:

- *Protects* and *improves* soil
- Food for *micro-organisms*
- Control soil *temperature*
- Suppresses *weeds*
- Improves soil *water* balance


16 t/ha dry matter

Good germination on good crop residue cover

Diversified cropping systems

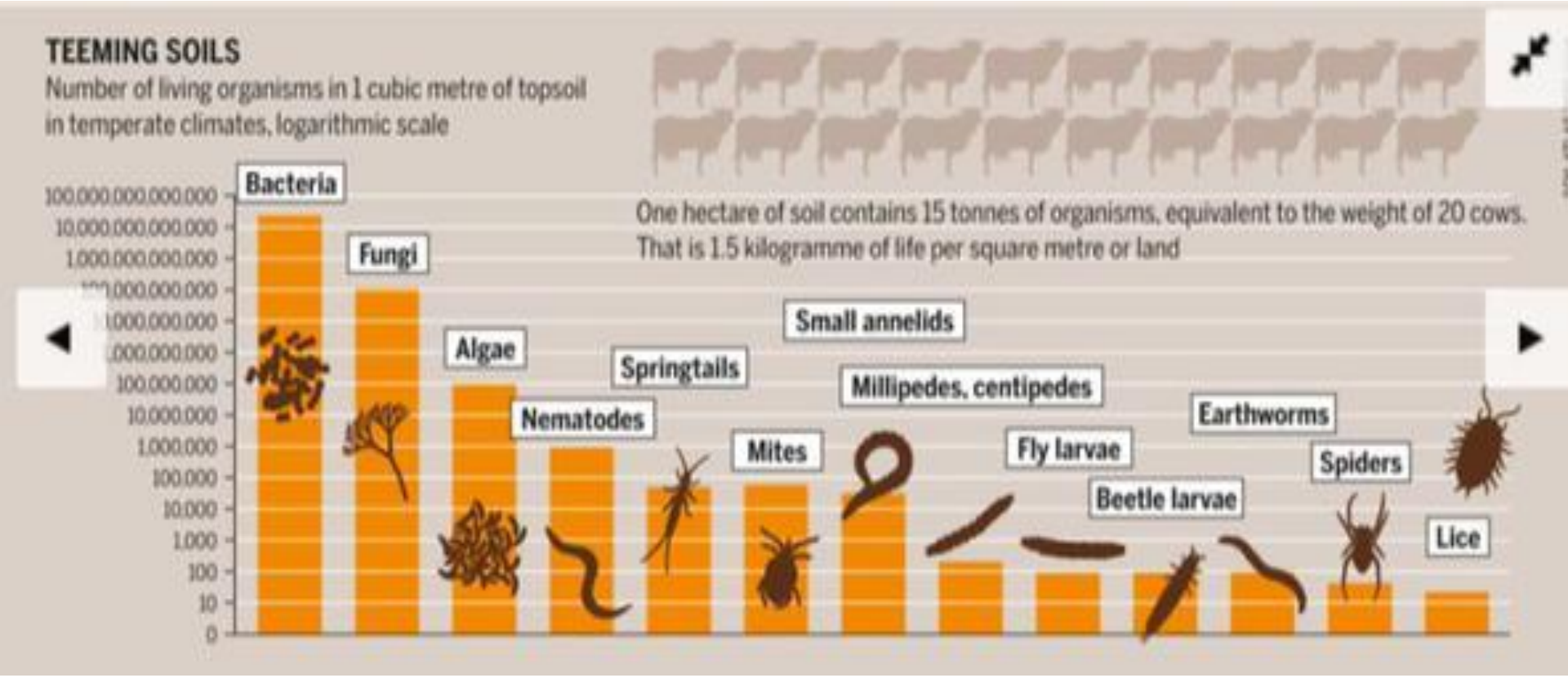


Main functions of rotational and cover crops:

- Provide quantity and quality (diversity) of biomass (dry matter, shading or ground cover) for weed, pest and erosion control
- Produce a positive residual fertilizer effect on following cash crops
- Provide food and fodder
- Diversity of food sources for microorganisms

Diversified cropping takes over the role of ploughing, fertilisers, pesticides & herbicides.

Who's living in 1 cubic meter of topsoil?



Cover Crops – warm season

Cover Crops – cool season

Cover Crops – management and integration with local systems

Integrated crop-livestock systems

- Roles of livestock: nutrient distribution, weed control, disease control, pest control, stubble management
- Need to manage competition for biomass (soil vs animals)

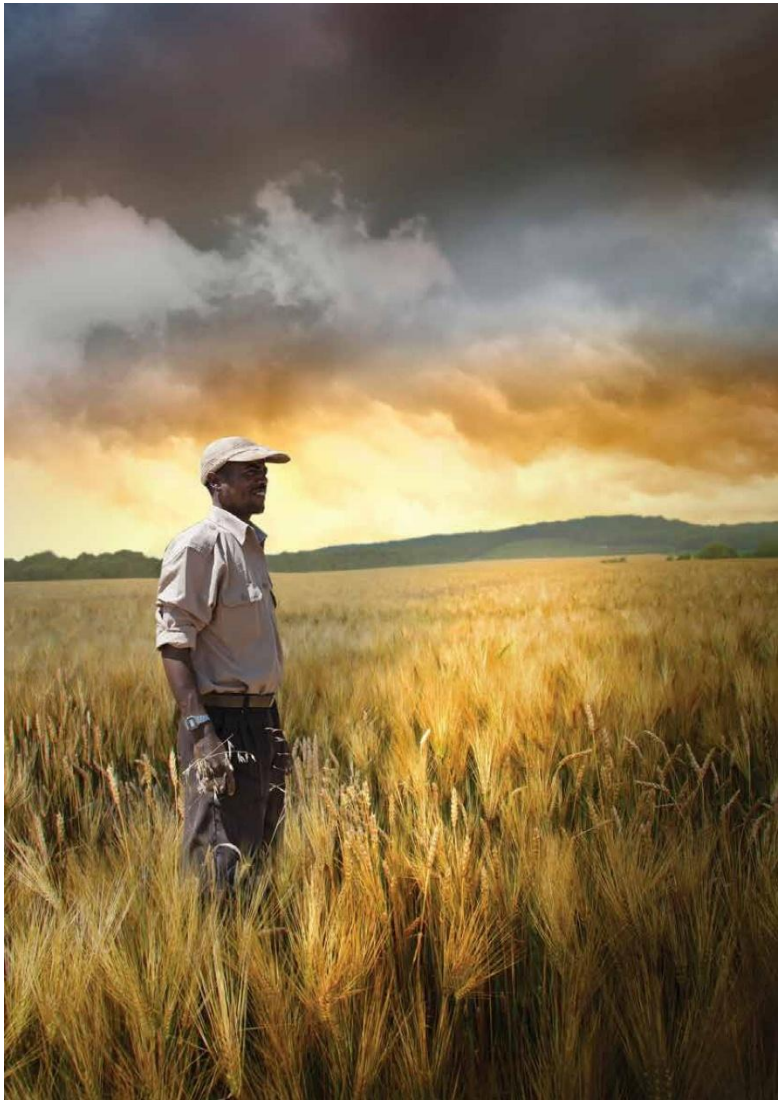
Ley cropping, Mpum Highveld

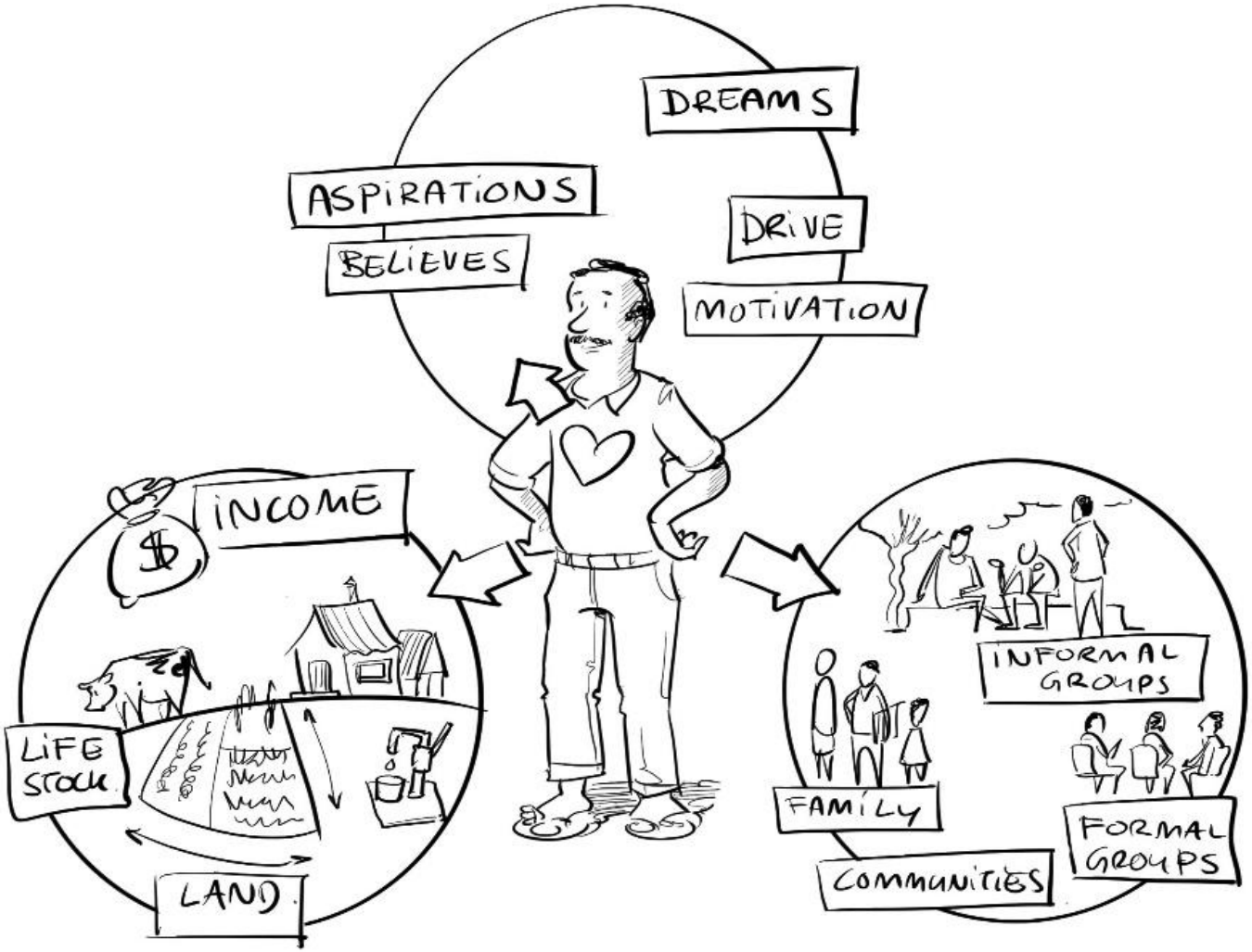
ECONOMIC BENEFITS

- By not ploughing and not using mechanical weed control, farmers can (in 2013):
  - save about 70% on labour,
  - using 60% less tractor-hours,
  - 60% less fuel and
  - saves 60% on maintenance costs
- Increasing crop diversity / rotations, even marginally, can have both large financial and environmental impacts.
  - Cover crops (legumes) can contribute up to 250 kg of soil nitrogen per hectare annually, amounting to cost savings of above R2000 per ha on N fertilisers (in 2013)
  - reduce weed seed banks, reduce crop losses to some insect pests and diseases compared to monocropped farming systems. **Less agrochemicals**.


"To be a successful farmer one must first
know the nature of the soil."
- Xenophon, Oeconomicus, 400 B.C.

Goal –Sustainable Farmers




DREAMS
ASPIRATIONS
DRIVE
BELIEVES
MOTIVATION
INCOME
$
LIFE STOCK
LAND
INFORMAL GROUPS
FAMILY
FORMAL GROUPS
COMMUNITIES

Moshav Villages
We are only steward of the land!


CONSERVATION AGRICULTURE
PROBLEMS
BIODIVERSITY
ARTICLE
IMPACT
FERTILIZER
NUTRIENT
MANURE
HIGHER
FARMER
SURFACE
YEAR
WORLD
WATER
RENEWABLE
SOIL
LEACHING
TILL
PRODUCTION
FIELD
ROOTING
CRUSTING
ORDER
AGRICULTURE
LONGER
PRINCIPLE
ORGANISMS
FEED
CONSERVE
CHANCE
GRAZE
RESPONSIBILITY
WASTE
CROP
LONG
DISTURBANCE
LAYER
WAYS
ROTATION
MULCH
AGRICULTURAL
YIELD
FUTURE
PRACTICING
FARMING
CONSERVATIONIST
PRACTICE
TILLAGE
LIVESTOCK
LOOKED
HASTENING
PROCESS
FERTILITY
EARTH
BENEFIT
PHOSPHATES
FOUNDATIONS FOR FARMING