8WCCA

8th World Congress on Conservation Agriculture

The future of farming

Profitable and Sustainable Farming with Conservation Agriculture

Bern, Switzerland
June 30th-July 2nd, 2020

History of the World Congresses on CA

The first World Congress on Conservation Agriculture was organized jointly by ECAF and FAO in 2001 in Madrid, Spain.

Since then:

- Iguassu-Brazil, 2003
- Nairobi-Kenya, 2005
- New Delhi-India, 2009
- Brisbane-Australia, 2011
- Winnipeg-Canada, 2014
- Rosario-Argentina, 2017

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Why again in Europe?

- Bid presented at the last WCCA
- Opportunity to raise awareness about the deliverables of CA
- Diverse constraints for CA adoption
- 8WCCA being held in Central Europe to facilitate bringing important stakeholder together
- The international appeal of 8WCCA will attract media attention which should lead to a **broader understanding and acceptance of CA**.

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Why in Switzerland?

- Swiss NT accepted the challenge
- Excellent conditions
- Switzerland a showcase of how Ag Policy can influence CA adoption
- Central location within Europe
- Possibility to provide a high CA diversity in post-Congress tours

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The Organizing Committee

- **Official organizers:** ECAF and Swiss NT
- **In collaboration with**: FAO
- **Main partner:** Bern University of Applied Sciences

Other support and partnerships

African Conservation Tillage Network

School of Agricultural, Forest and Food Sciences HAFL

Italian Ministry of Agricultural, Food and Forest Policy

Canton Berne

LIFE Programme

Why this main theme for the 8WCCA?

The future of farming

Profitable and Sustainable Farming with

Conservation Agriculture

Conservation Agriculture is the only ecological and regenerative agricultural model able to bring together the profitability of farmers and the environmental protection while offering ecosystem services, climate change mitigation and adaptability and satisfying the demands of civil society.

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Conventional vs. Conservation Agriculture

- Soil threats (degradation of farmland)
- Water efficiency (addressing water scarcity)
- Response to Climate Change (mitigation, adaptation)
- Productivity (sustain the demand of FFFF)
- Profitability (avoid abandonment of farming activity)

Soil threats: Erosion

- Global potential soil erosion rates of 43 (-7 , +9.2) Gt yr^{-1}
- In Europe about 1 Gt yr^{-1}
- Water erosion causes over 50% of total P losses (4–19 kg ha^{-1} yr^{-1})

Source: EU-JRC, ESDAC

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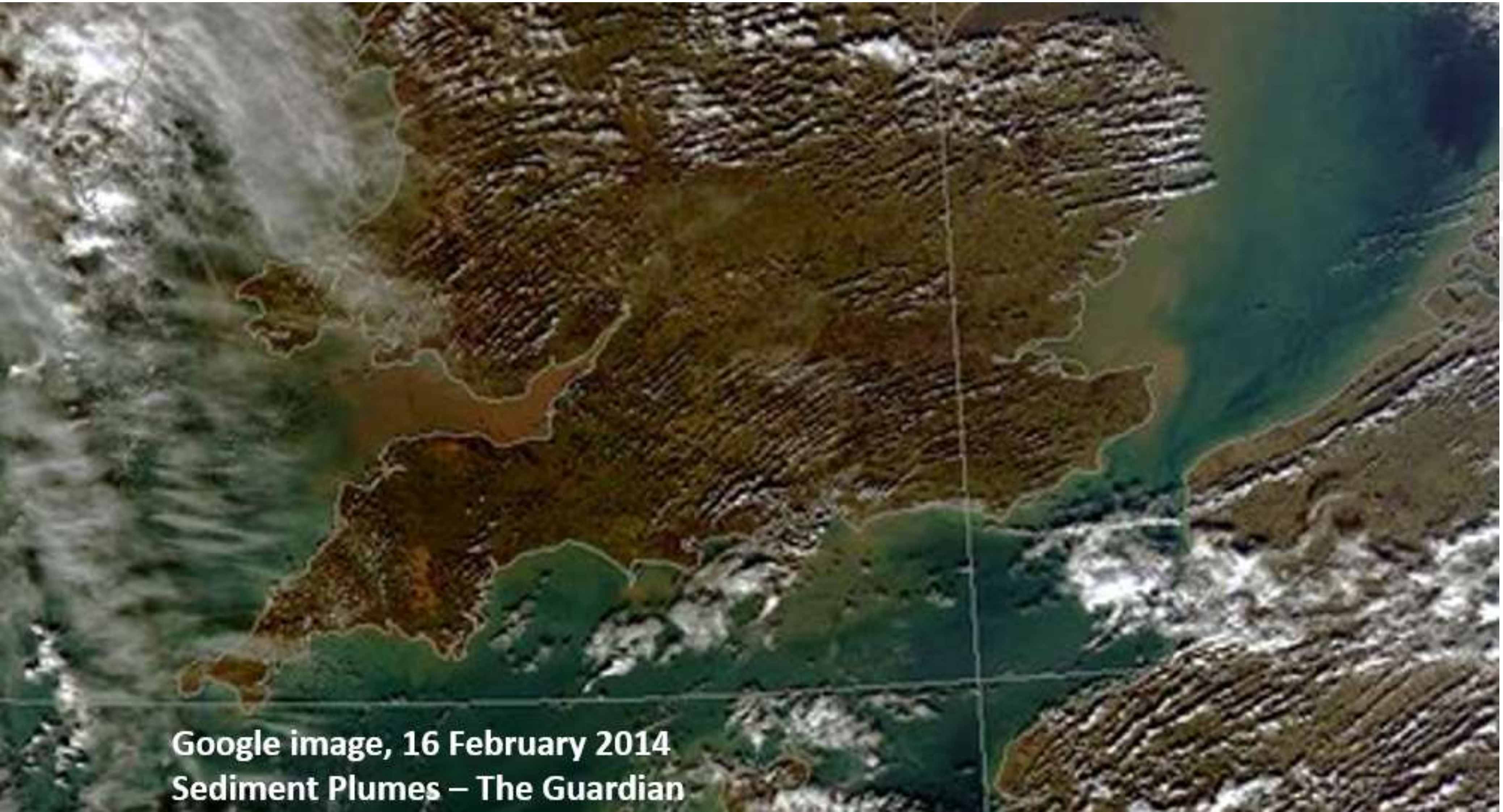
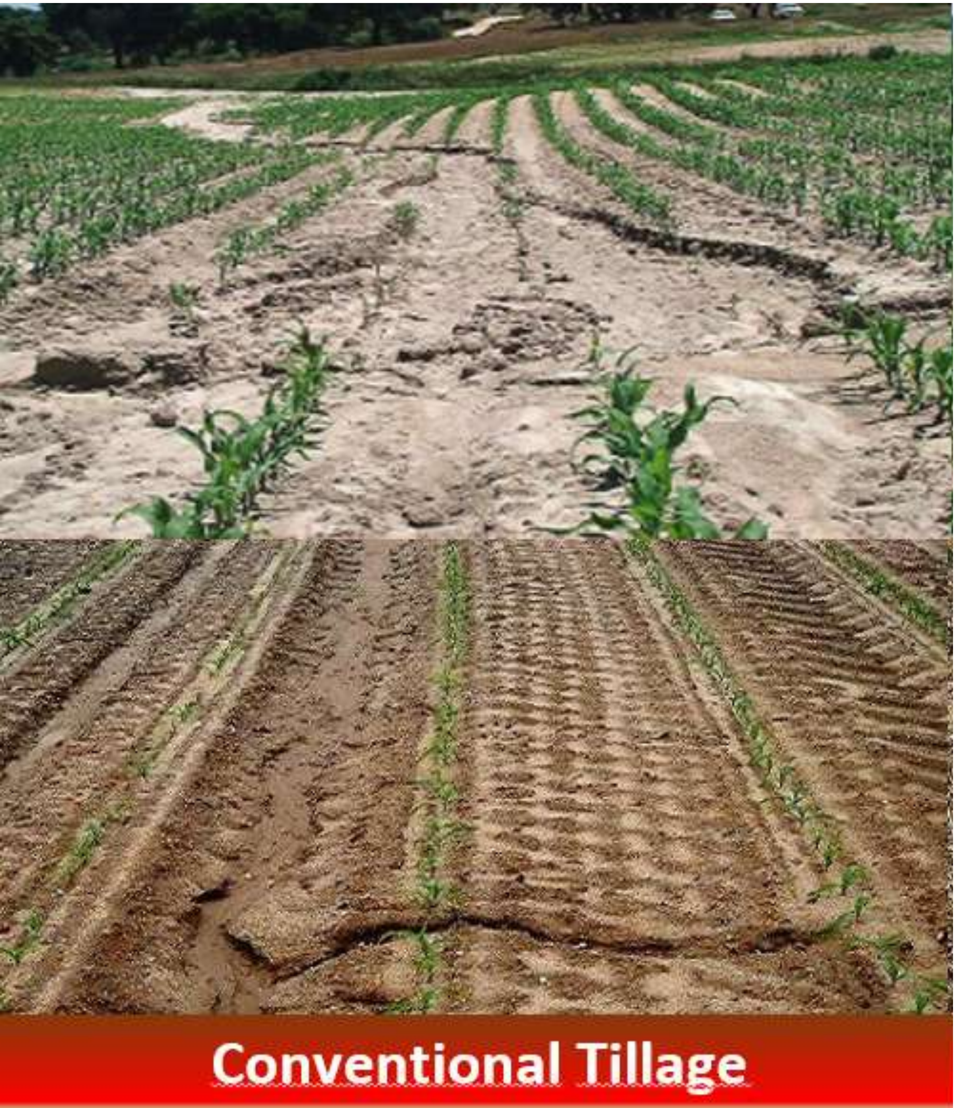
Soil threats: Erosion



Soil threats: Erosion - The only way to avoid



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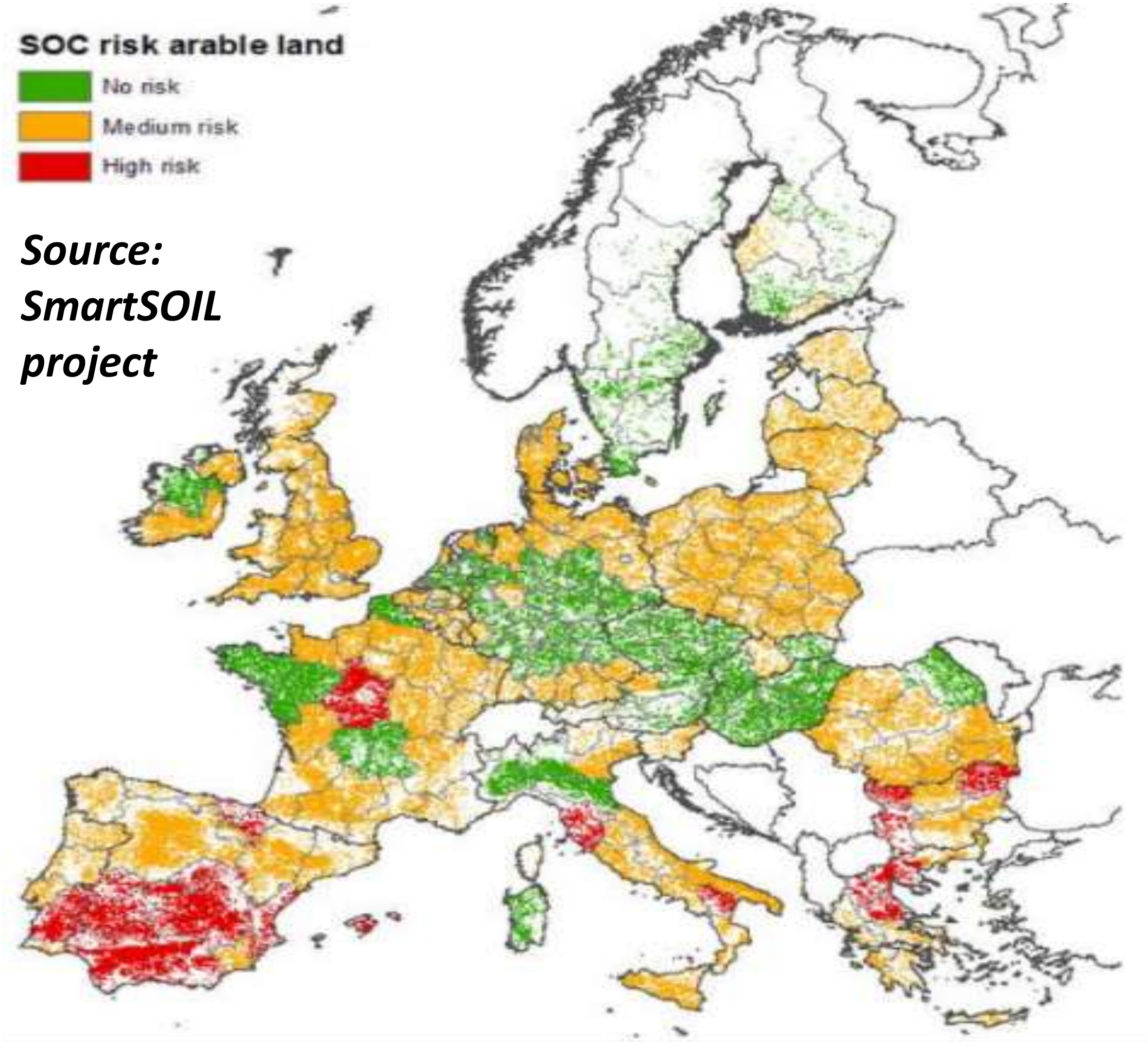
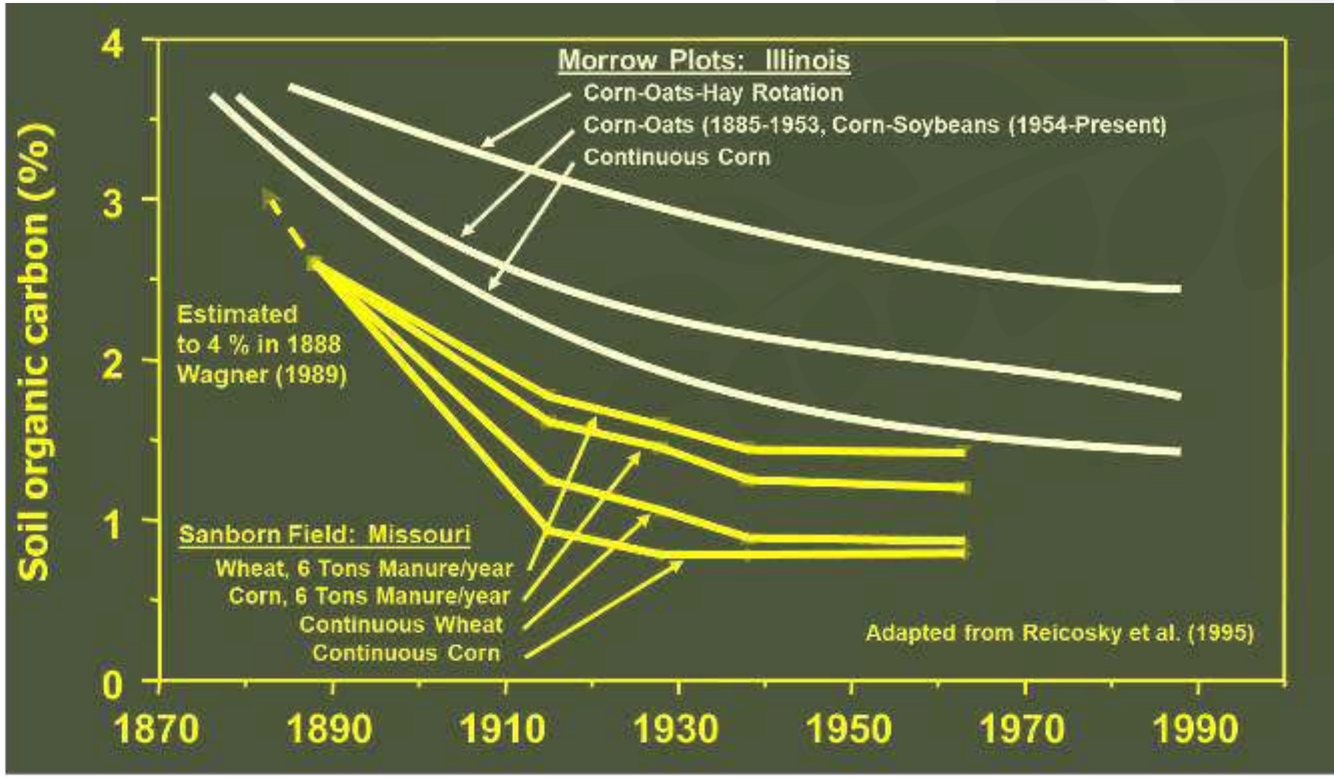
Soil threats: Decline in SOM (fertility)

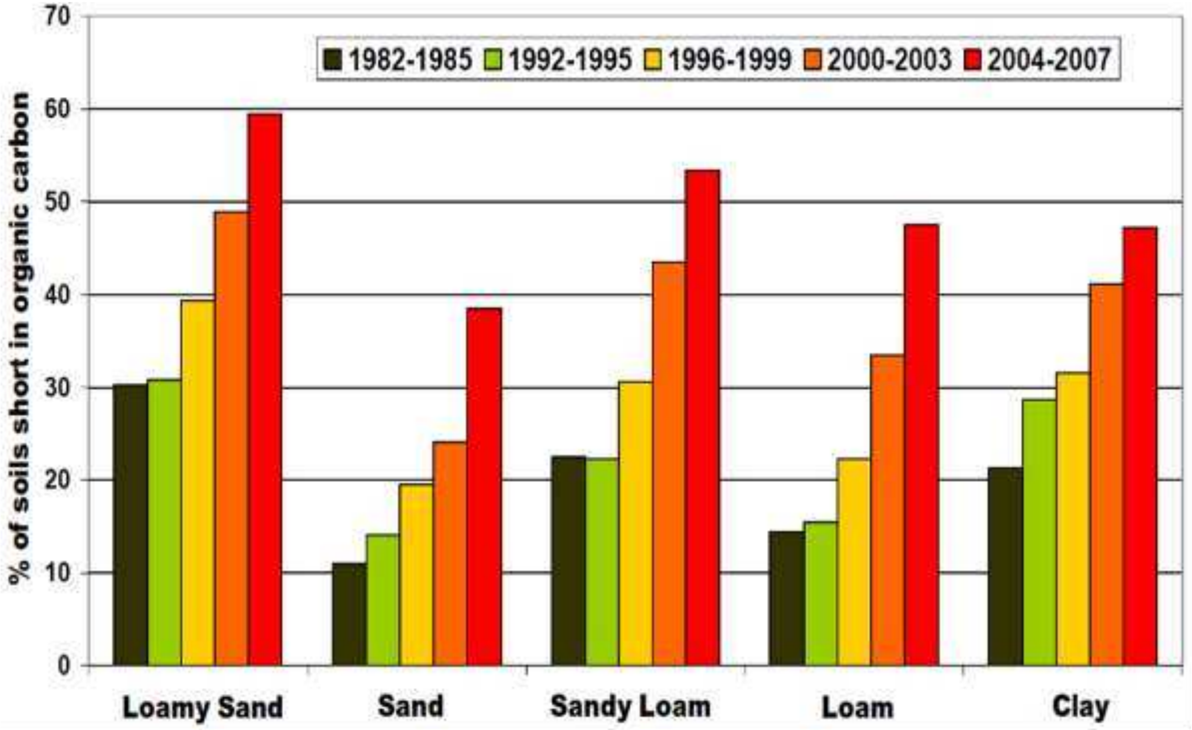


Source: SmartSOIL project



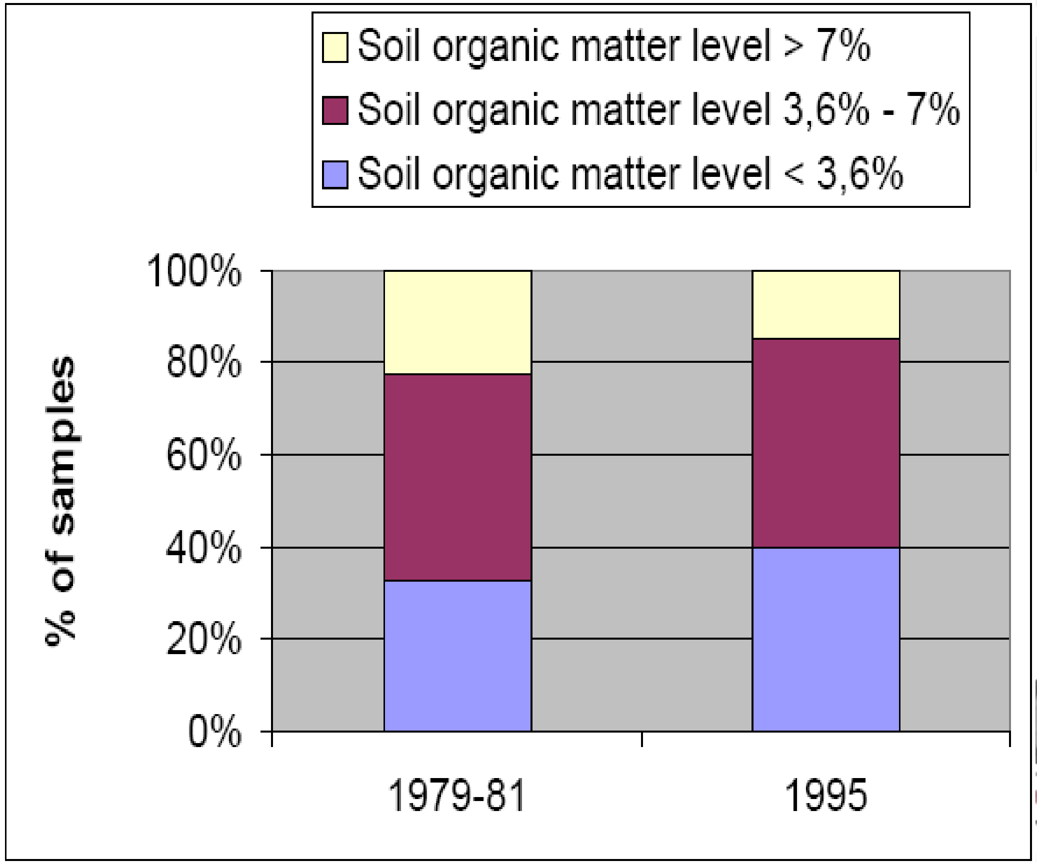
Soil threats: Decline in SOM (fertility)

Belgium



Evolution of percentage of arable soils short in soil organic carbon, based on more than 60,000 samples taken every 3 years to a depth of 23 cm (Gobin, 2005)

England and Wales. **Source : MAFF (2000)**



Soil threats: Decline in SOM (fertility)

TABLE 5.5
RELATIVE STOCK CHANGE FACTORS (F_{LU}, F_{MG}, AND F_I) (OVER 20 YEARS) FOR DIFFERENT MANAGEMENT ACTIVITIES ON CROPLAND

Factor value type	Level	Temper-ature regime	Moist-ure regime[1]	IPCC defaults	Error[2,3]	Description
Land use (F_{LU})	Long-term culti-vated	Tem-perate/ Boreal	Dry	0.80	± 9%	Represents area that has been continuously managed for >20 yrs, to predominantly annual crops. Input and tillage factors are also applied to estimate carbon stock changes. Land-use factor was estimated relative to use of full tillage and nominal ('medium") carbon input levels.
			Moist	0.69	± 12%	
		Tropical	Dry	0.58	± 61%	
			Moist/ Wet	0.48	± 46%	
		Tropical montane[4]	n/a	0.64	± 50%	

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Soil threats: Decline in SOM (fertility)

Factor value type	Level	Temper-ature regime	Moist-ure regime[1]	IPCC defaults	Error[2,3]	Description
Tillage (F_{MG})	Full	All	Dry and Moist/ Wet	1.00	NA	Substantial soil disturbance with full inversion and/or frequent (within year) tillage operations. At planting time, little (e.g., <30%) of the surface is covered by residues.
Tillage (F_{MG})	Re-duced	Tem-perate/ Boreal	Dry	1.02	$\pm$ 6%	Primary and/or secondary tillage but with reduced soil disturbance (usually shallow and without full soil inversion). Normally leaves surface with >30% coverage by residues at planting.
			Moist	1.08	$\pm$ 5%	
		Tropical	Dry	1.09	$\pm$ 9%	
			Moist/ Wet	1.15	$\pm$ 8%	
		Tropical montane[4]	n/a	1.09	$\pm$ 50%	
Tillage (F_{MG})	No-till	Temperat e/ Boreal	Dry	1.10	$\pm$ 5%	Direct seeding without primary tillage, with only minimal soil disturbance in the seeding zone. Herbicides are typically used for weed control.
			Moist	1.15	$\pm$ 4%	
		Tropical	Dry	1.17	$\pm$ 8%	
			Moist/ Wet	1.22	$\pm$ 7%	
		Tropical montane[4]	n/a	1.16	$\pm$ 50%	

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Food and Agriculture Organization of the United Nations

Soil threats: Decline in biodiversity

- **<u>Unsustainable farming practices</u>**, the effects of climate change and soil pollution are just a few of the things that can adversely affect the health and biodiversity of our soils.

https://www.youtube.com/watch?v=hbdsHOnd_gw&feature=youtu.be

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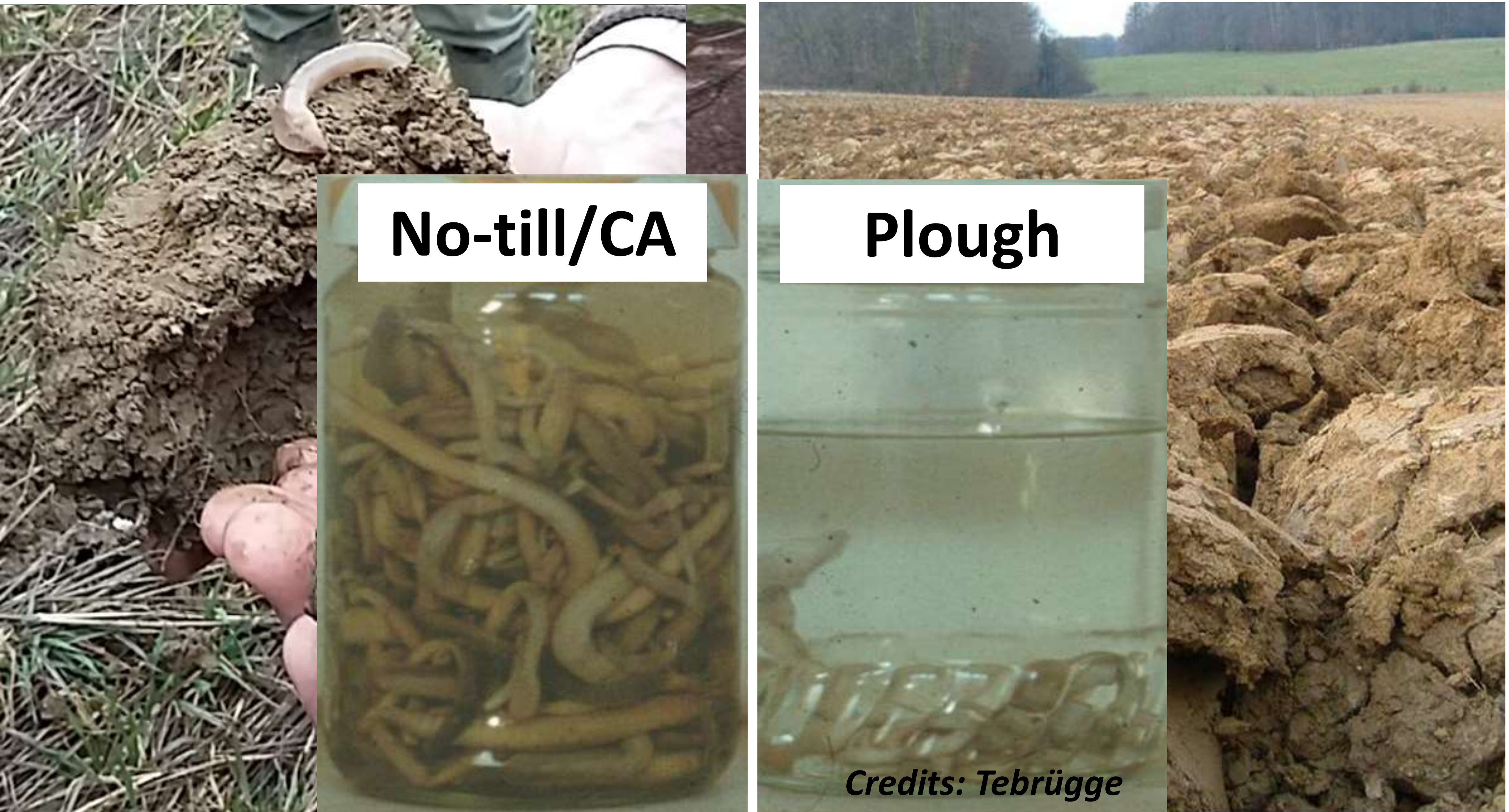
Soil threats: Decline in biodiversity



Below-ground

Soil threats: Decline in biodiversity

Above-ground

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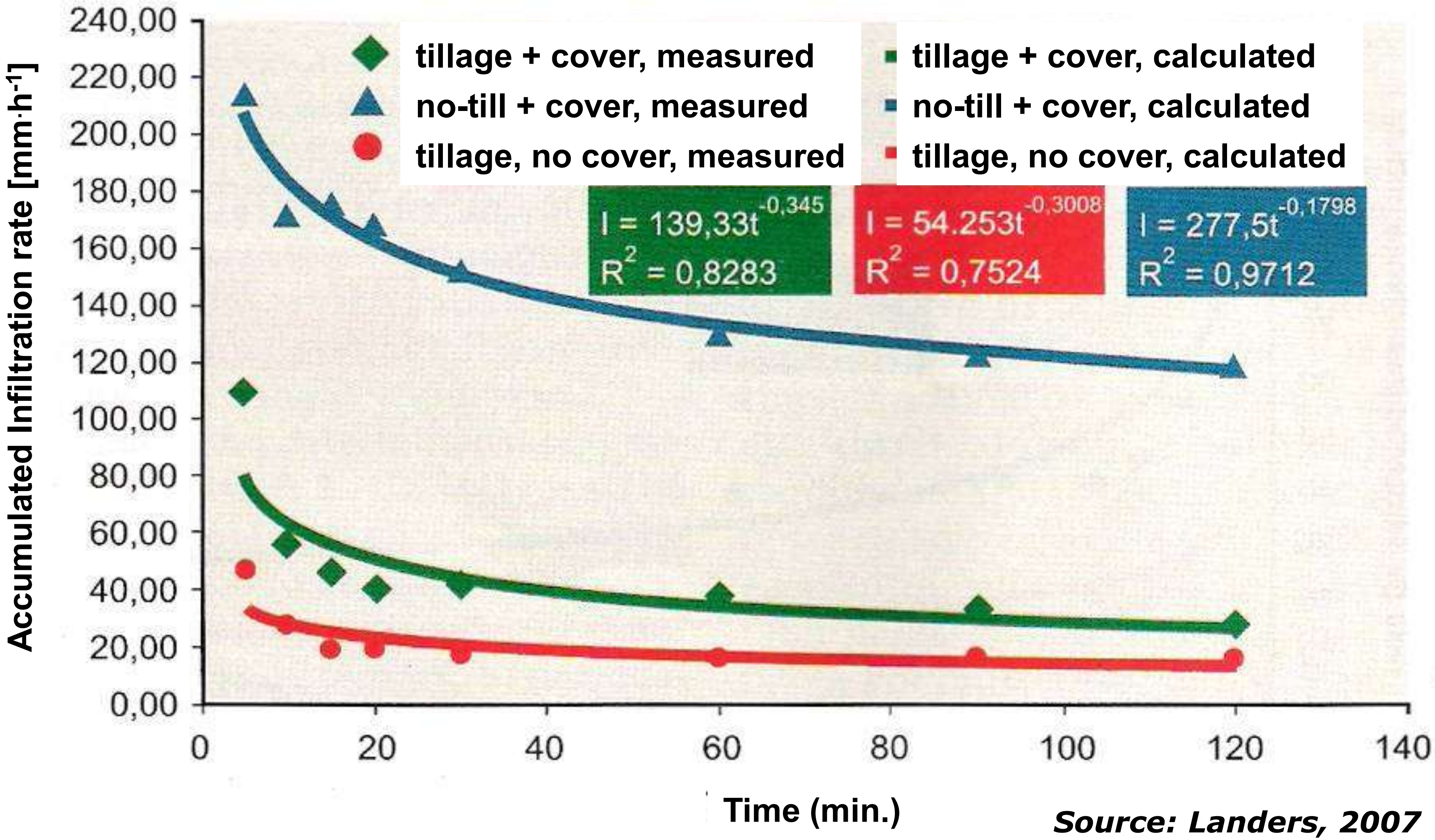
Soil threats: Compaction

Water efficiency: Infiltration



Source: Landers, 2007

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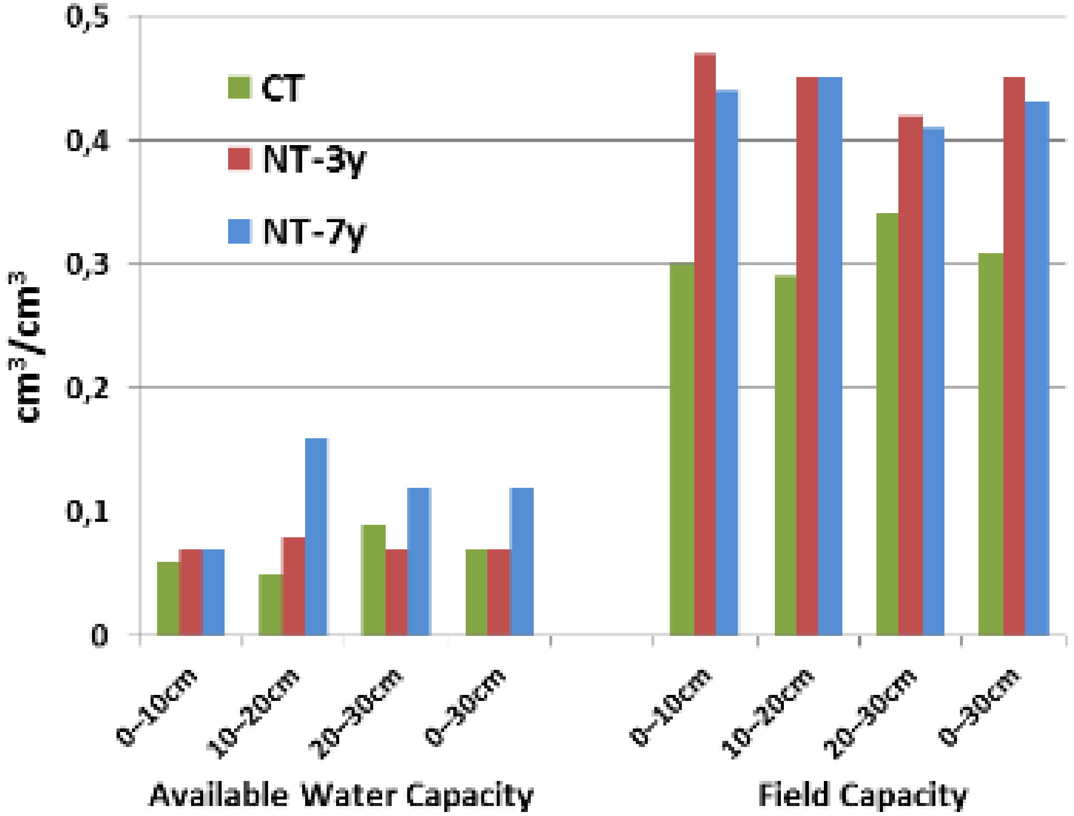
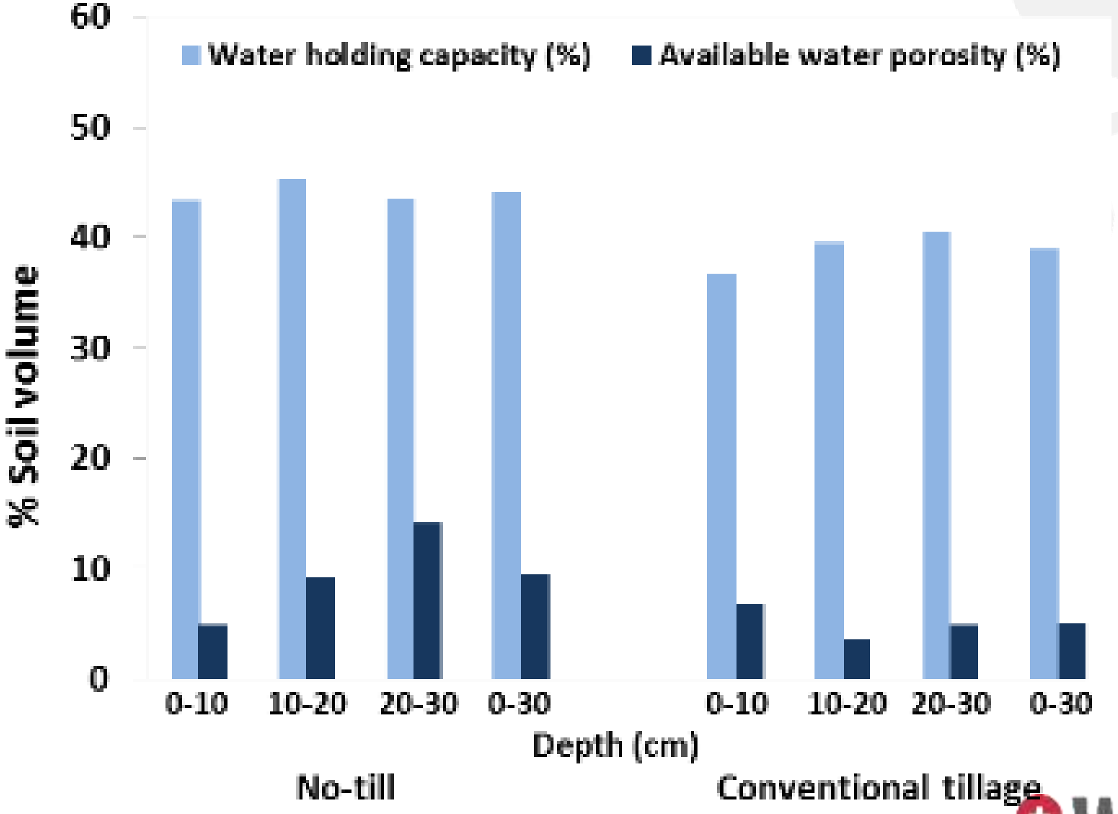
Water efficiency: Storage



Source: Jemai et al. 2013



Source: Carvalho and Basch, 1995

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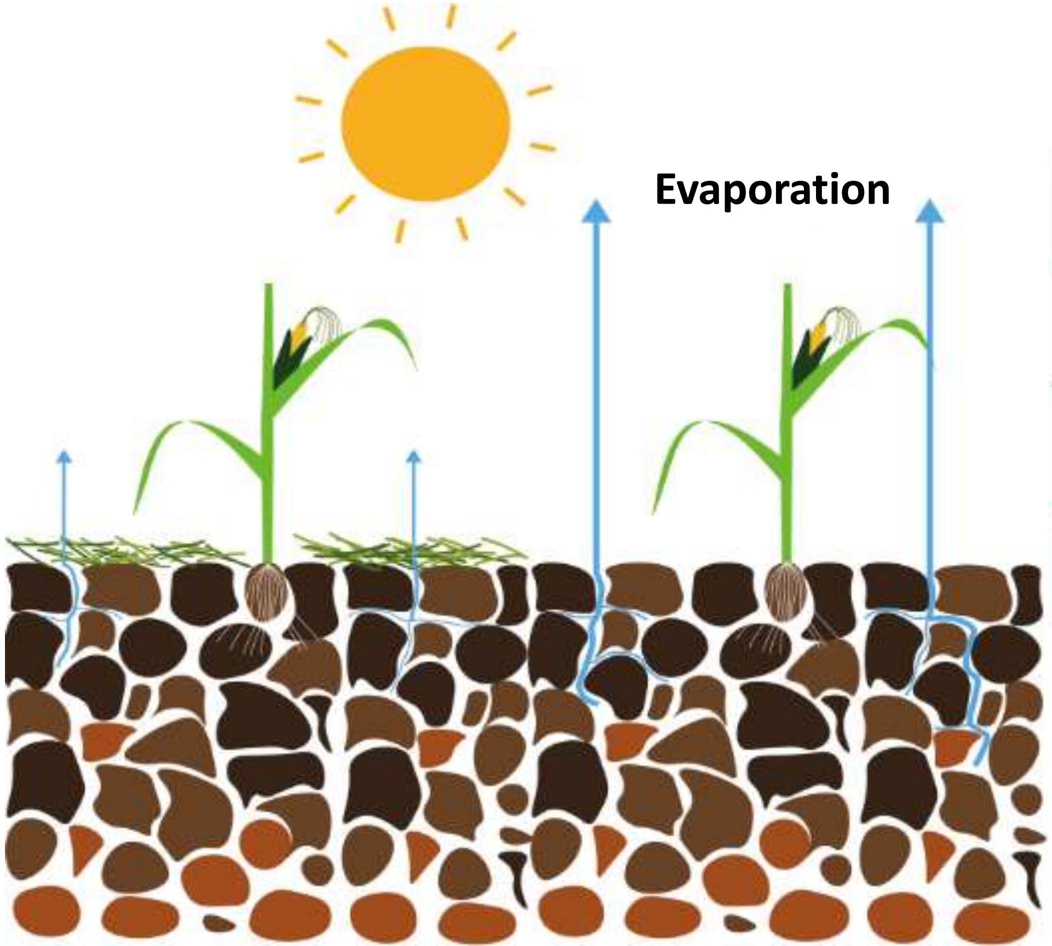
Water efficiency: Evaporation losses



Soil cover (%)	Evaporation acc. (mm)
0	102,8
53	97,4
75	81,2
100	60,6

Klocke et al., 2009

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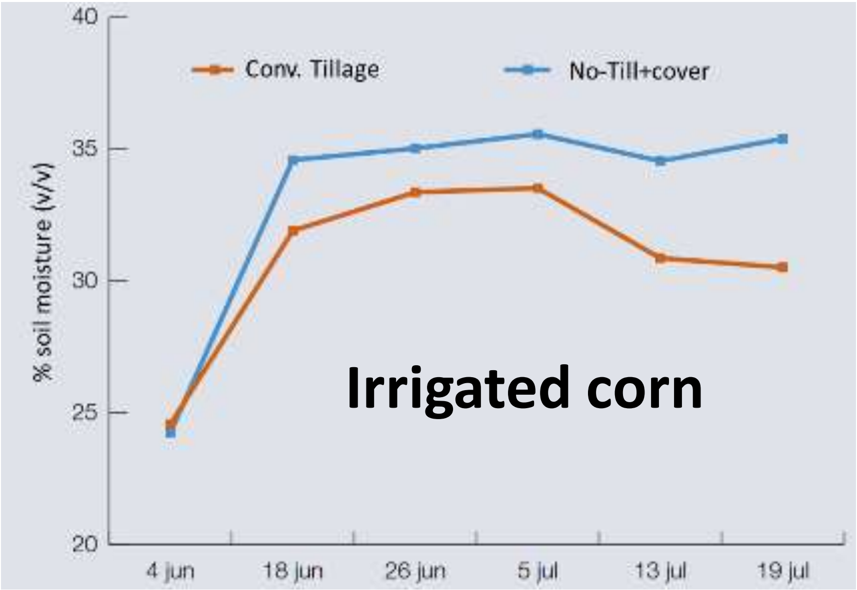
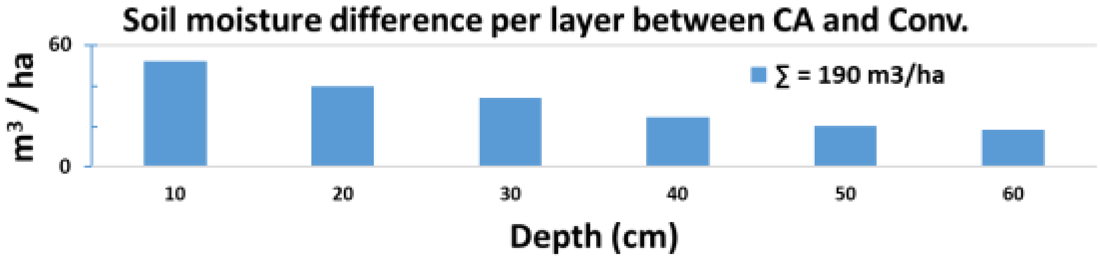
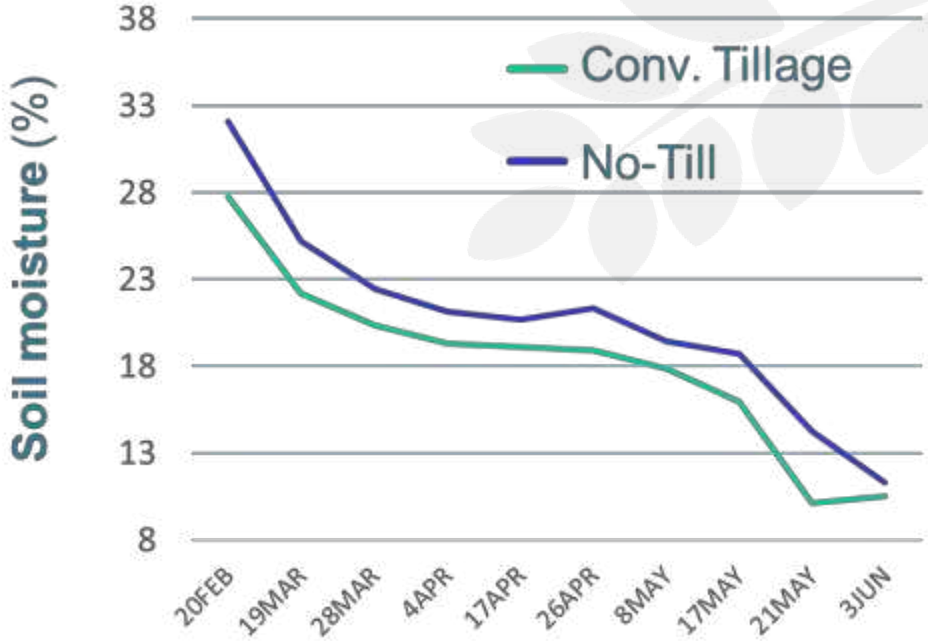
Water efficiency: Evaporation losses







Rainfed wheat

Source: Basch, unpublished data

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Water efficiency: Evaporation losses

Conservation Agriculture Conventional

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Response to Climate Change: Mitigation

- Creating a positive balance between gains and losses of carbon in the soil
- GHG emission reduction
  - CO_2
    - Less fuel use
    - Reduction of external, energy demanding inputs
  - N_2O
  - CH_4

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Response to Climate Change: Mitigation

- **Creating a positive balance between gains and losses of carbon in the soil**

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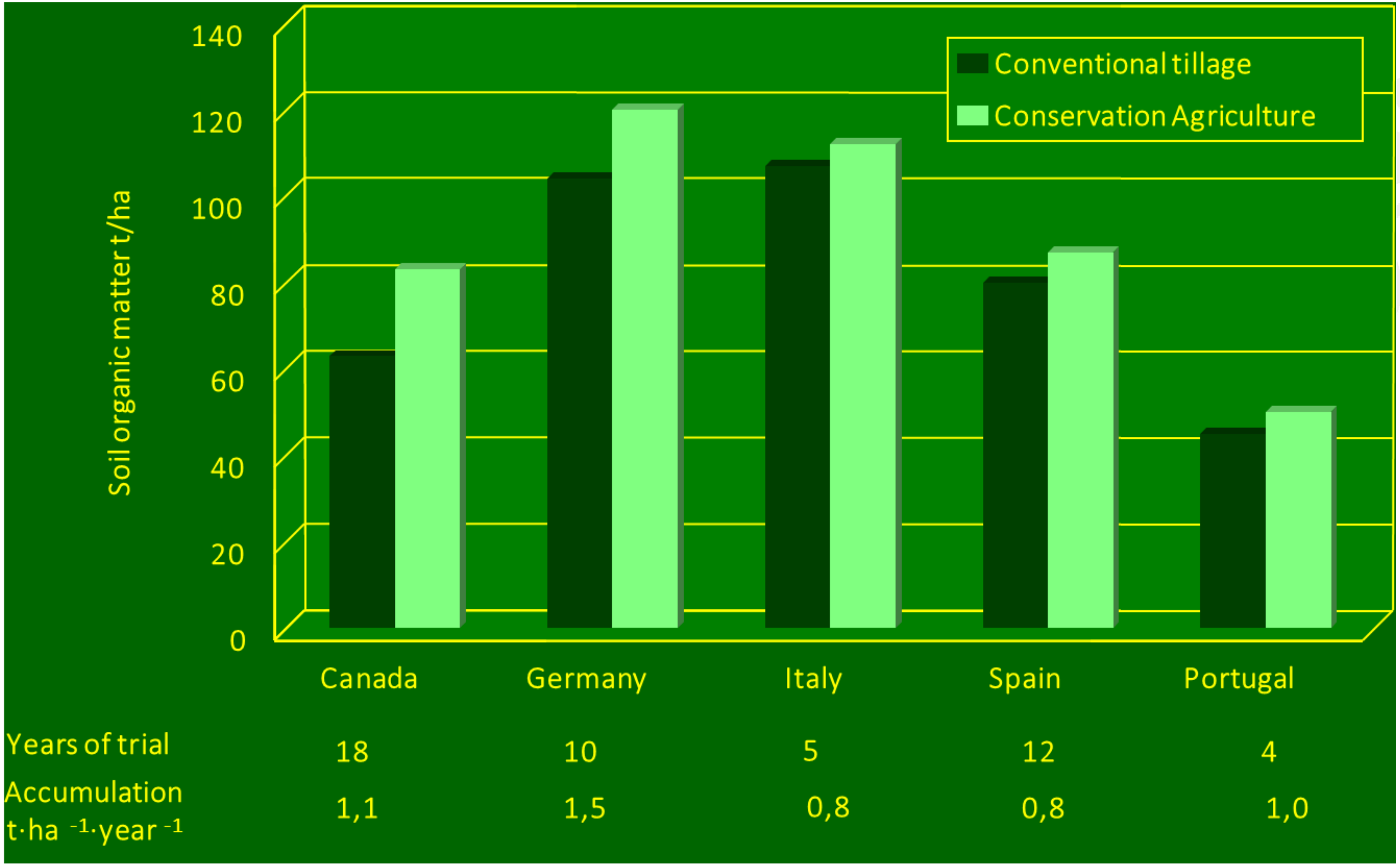
Response to Climate Change: Mitigation



Source: Tebrügge, 2001

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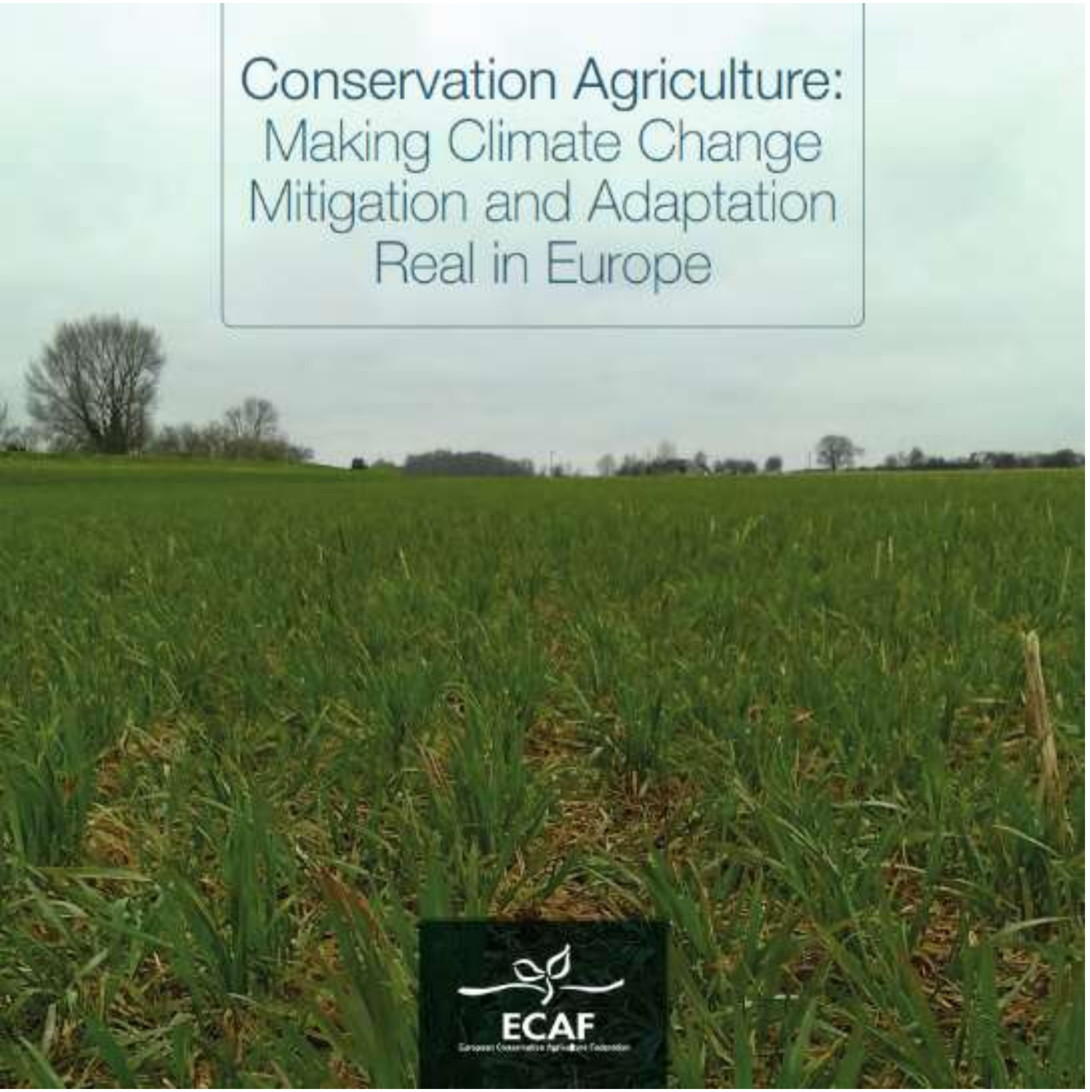
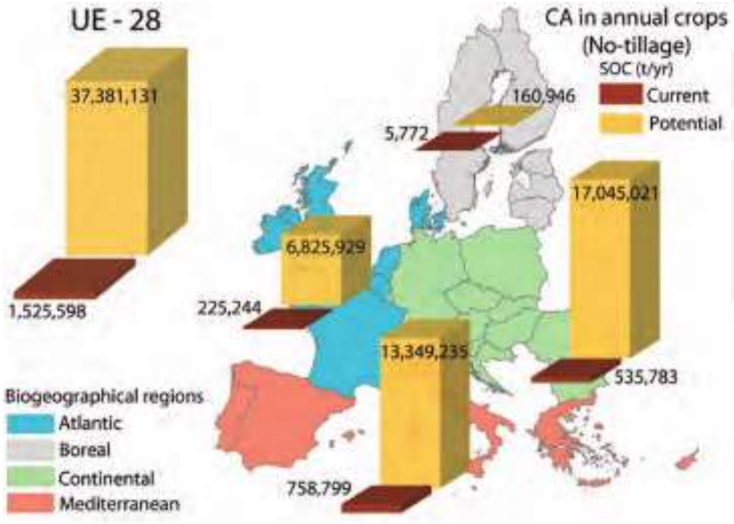
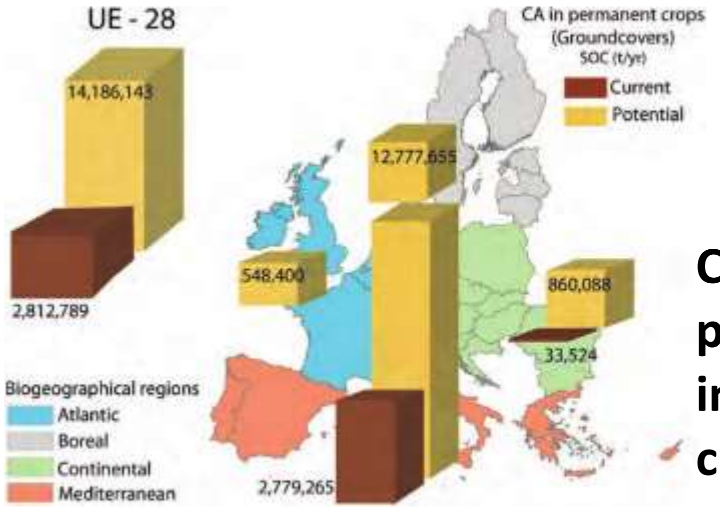
Response to Climate Change: Mitigation



C-Sequestration potential of CA in annual crops





C-Sequestration potential of CA in perennial crops

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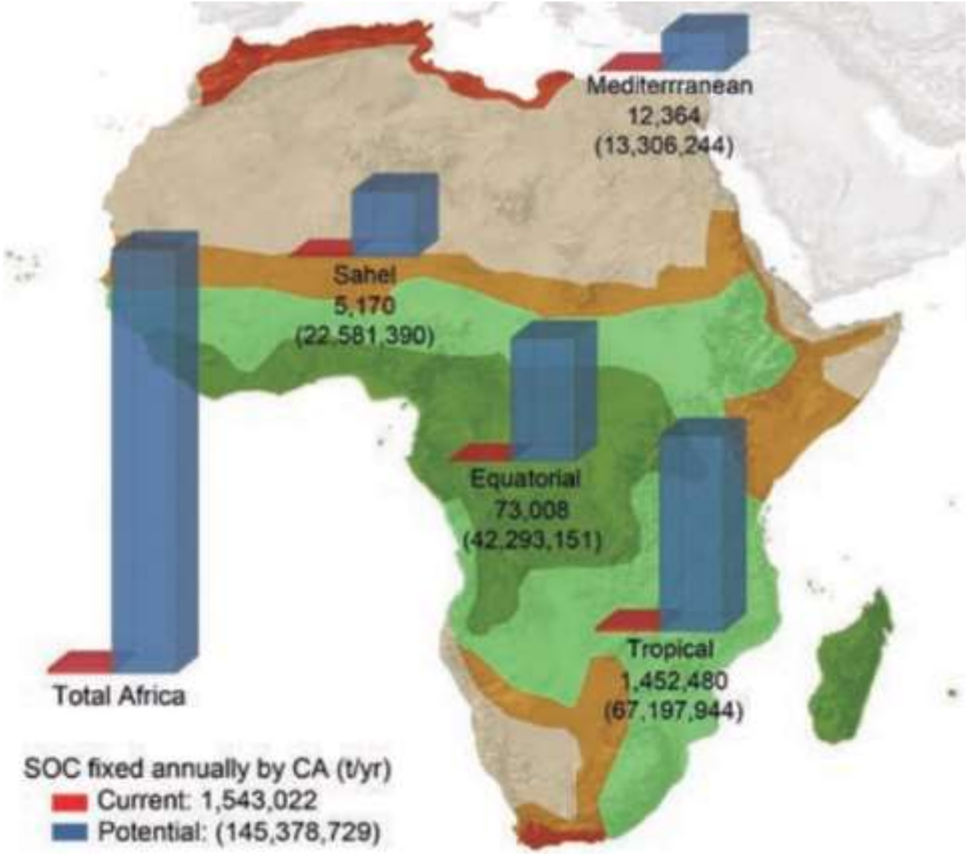
Response to Climate Change: Mitigation



C-Sequestration potential of CA on African cropland

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Response to Climate Change: Mitigation

- Creating a positive balance between gains and losses of carbon in the soil
- **GHG emission reduction**
  - **CO_2**
    - **Less fuel use**
    - **Reduction of external, energy demanding inputs**

      (*e.g.* fertilizers, pesticides and machinery manufacturing, water transport, etc.)

Response to Climate Change: Mitigation

- Creating a positive balance between gains and losses of carbon in the soil
- GHG emission reduction
  - CO_2
    - Less fuel use
    - Reduction of external, energy demanding inputs
  - **N_2O**
  - **CH_4**

  Reduced emissions over time through improved drainage and reduced N-inputs

Response to Climate Change: Adaptation

- Improved resilience to extreme events of:
  - Excess rainfall (runoff, erosion, landslides)
  - Drought (more water intake and retention, less losses and higher WUE)
  - Heat (lower soil temperatures through mulch)
- Lowering losses in case of failure/disaster
- Faster recovery

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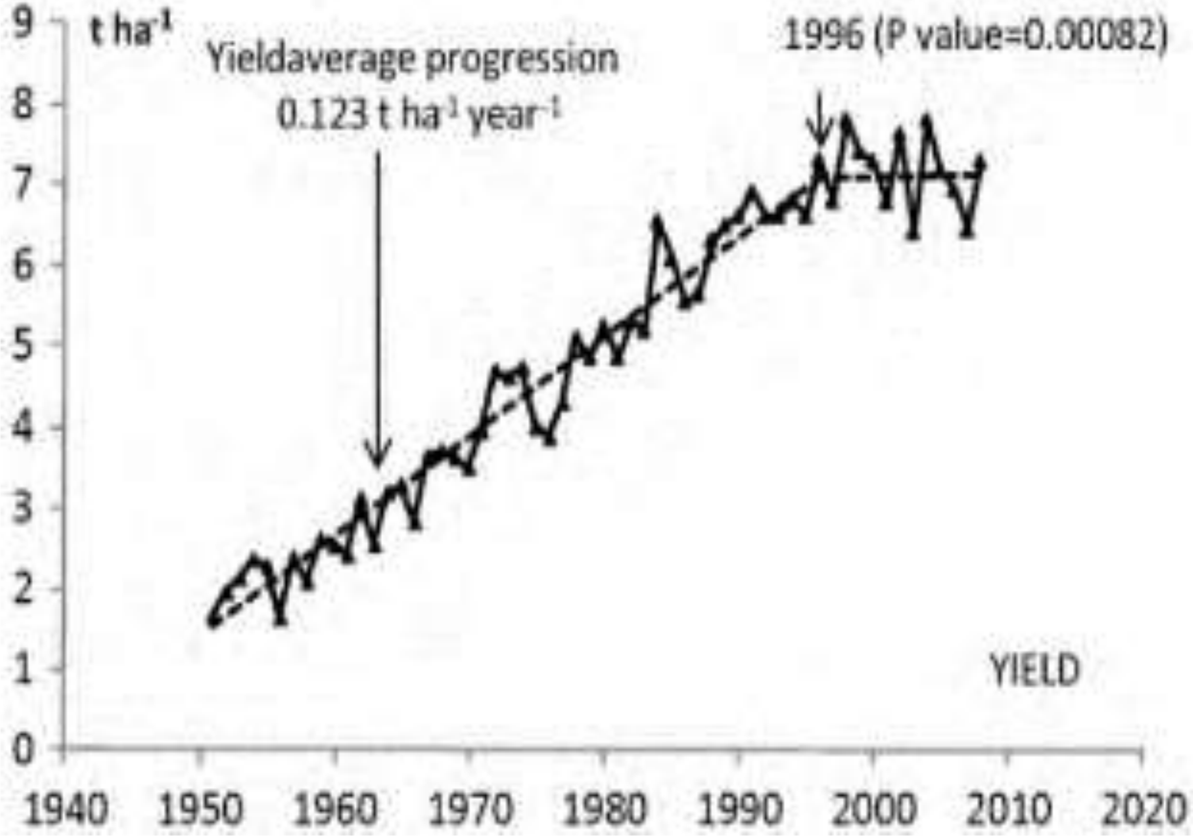
Productivity: function of soil quality and health

- Regression analysis of wheat yields throughout various European countries



Country	Year of stagnation
Denmark	1995 (**)
France	1996 (**)
Germany	1999
Italy	1994
Netherlands	1993 (**)
Spain	1989
Switzerland	1990 (**)
United Kingdom	1996 (**)

Source: Brisson et al. 2010

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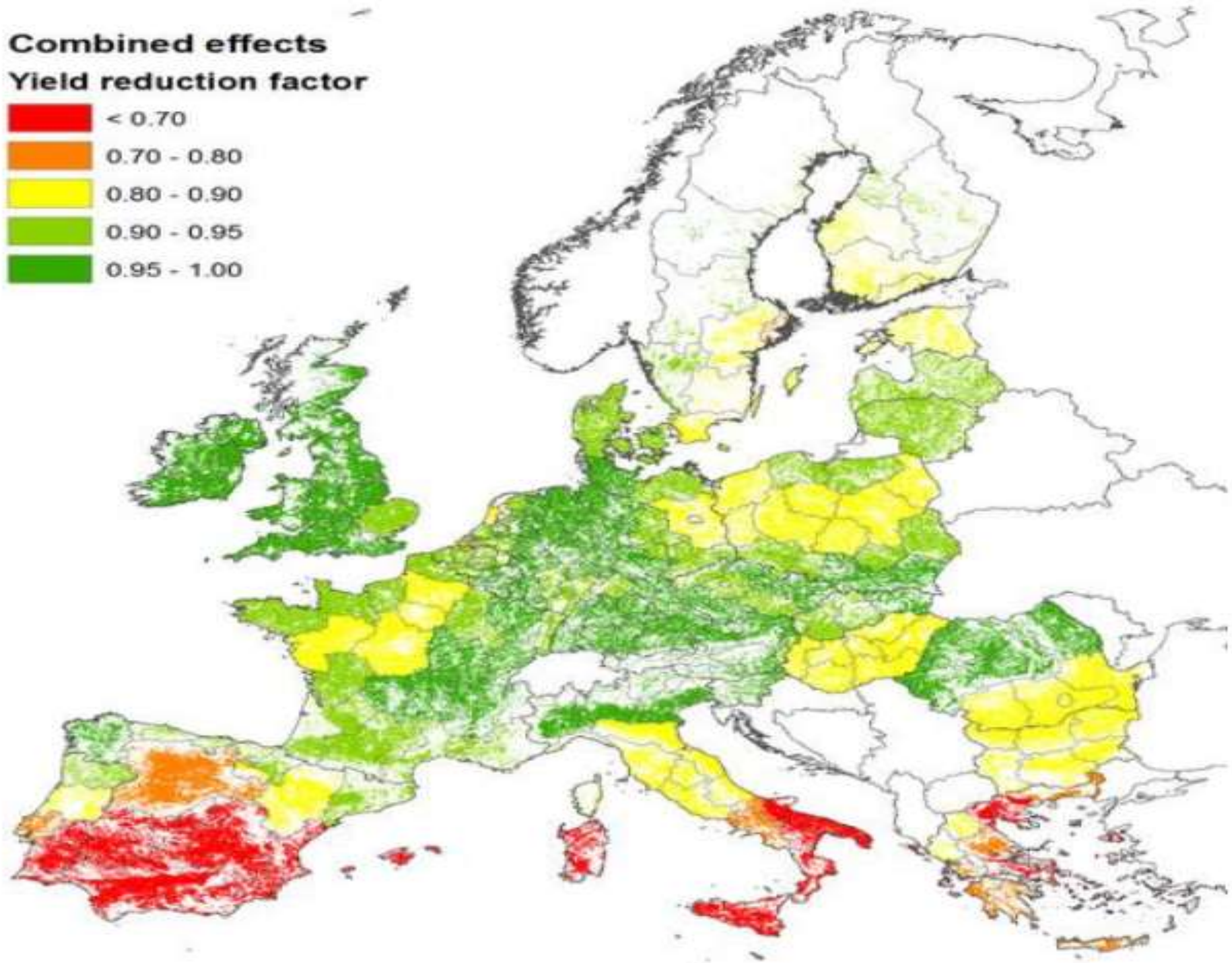
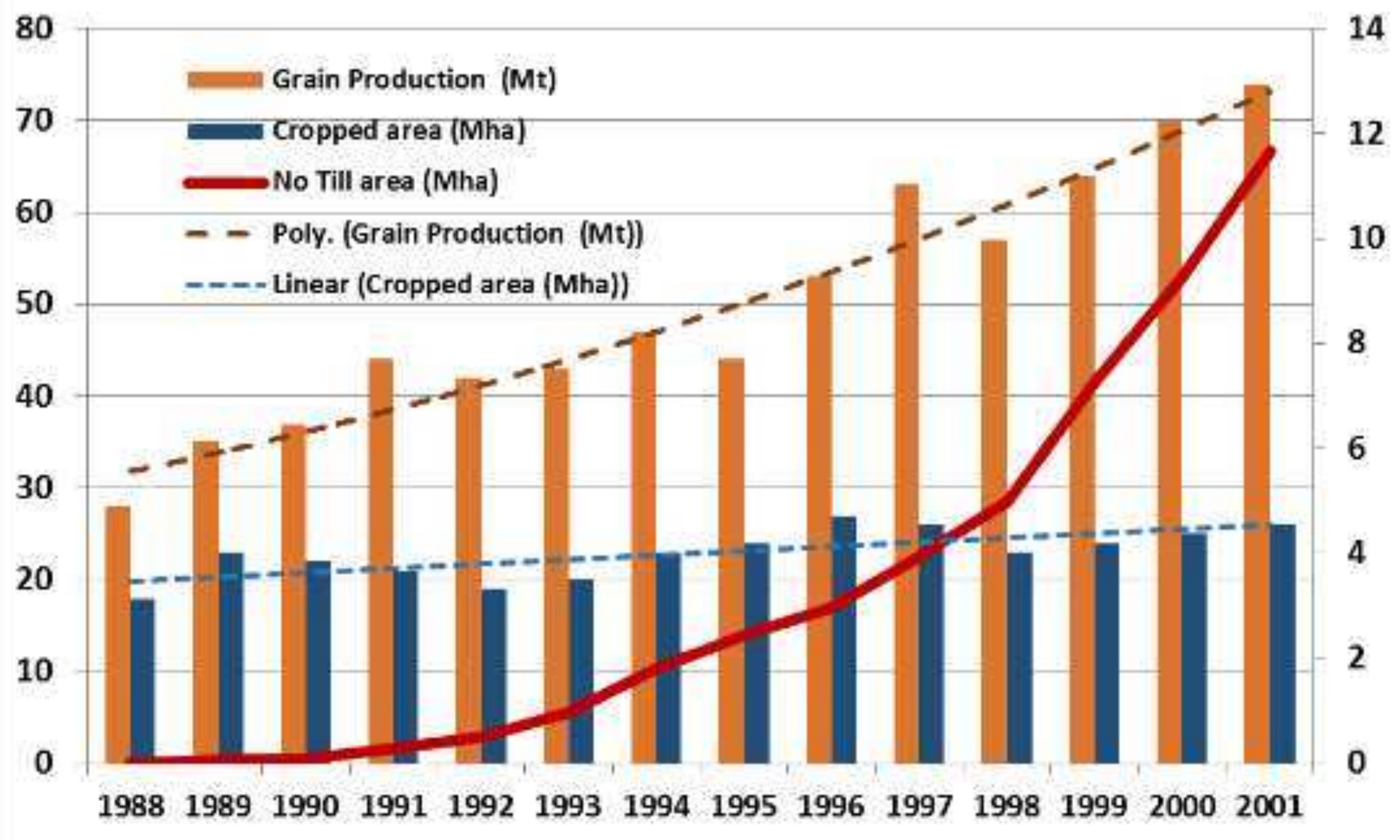
Productivity: function of soil quality and health



- Yield impact of Soil Organic Carbon (SmartSOIL model)

Productivity: At large scale

- Argentina – adoption of CA and evolution of yields



Source: Peiretti, 2002

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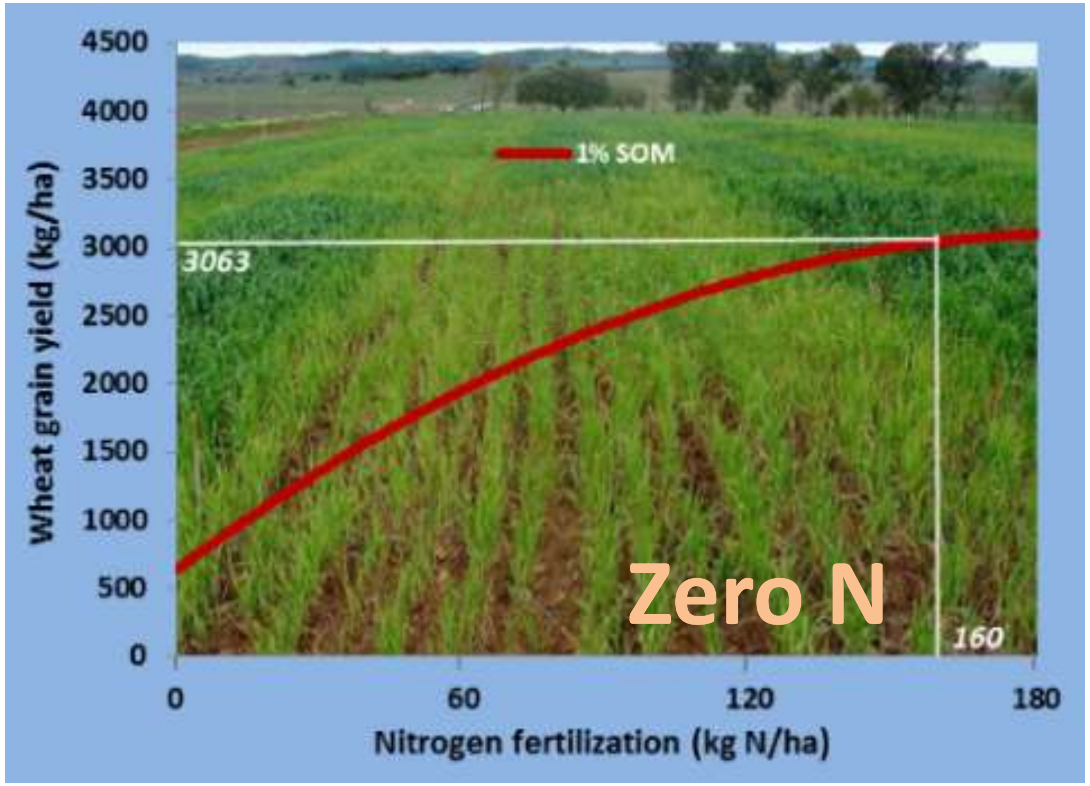
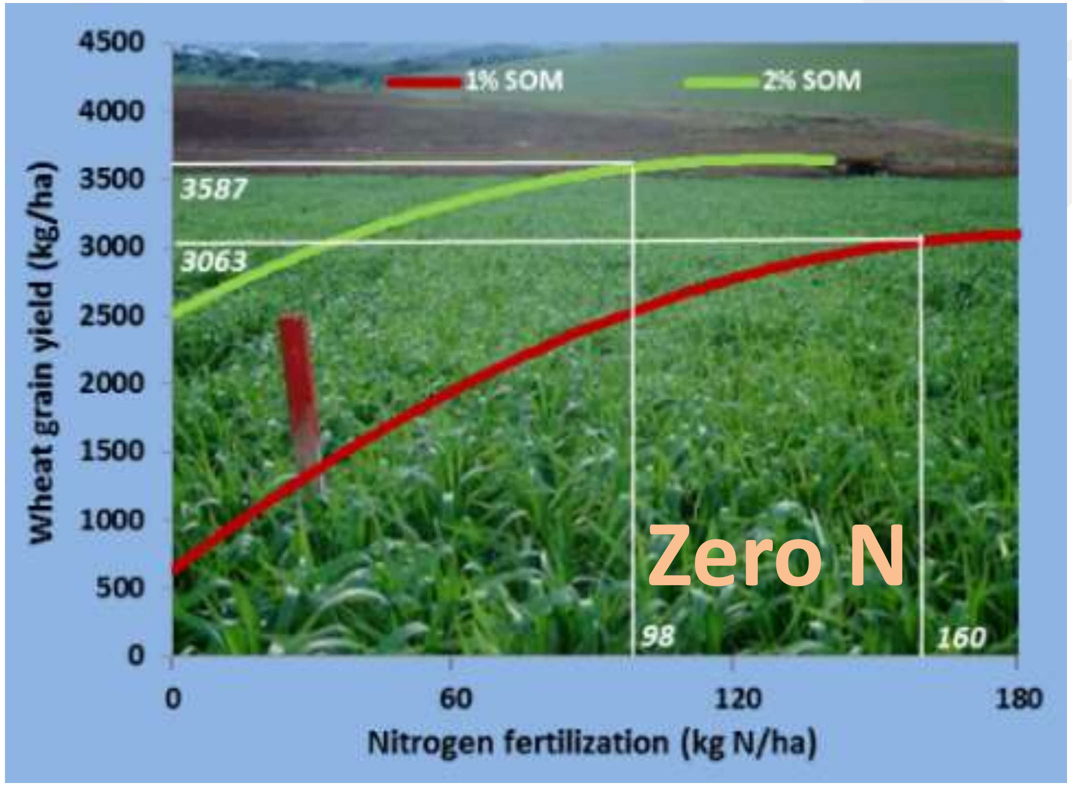
Profitability: Improved input use efficiency

- Nitrogen use efficiency



(Conventional Tillage)



(after 11 years of No-till/CA)

Source: Carvalho et al., 2012

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Profitability: Cost reduction

- Less expenses with crop establishment
  - Variable annual expenses with tractors and drilling equipment (340 ha farm (rainfed) in South Portugal)

Cost Item	Conventional Tillage (CT)	No-till (NT)	Reduction
	(in 2000)	(in 2003)	
Maintenance and repair of tractors*	10,450.47 €	1,507.15 €	85.6%
Maintenance and repair of tillage/drilling equipment	8,158.41 €	1,840.00 €	77.5%
Fuel	17,460.00 €	7,110.00 €	60%
Labour	25,000.00 €	15,000.00 €	40%
Total	61,068.88 €	25,457.15 €	58.3%

* 4 tractors with a total of 384 HP under CT and 2 tractors with 143 HP under NT

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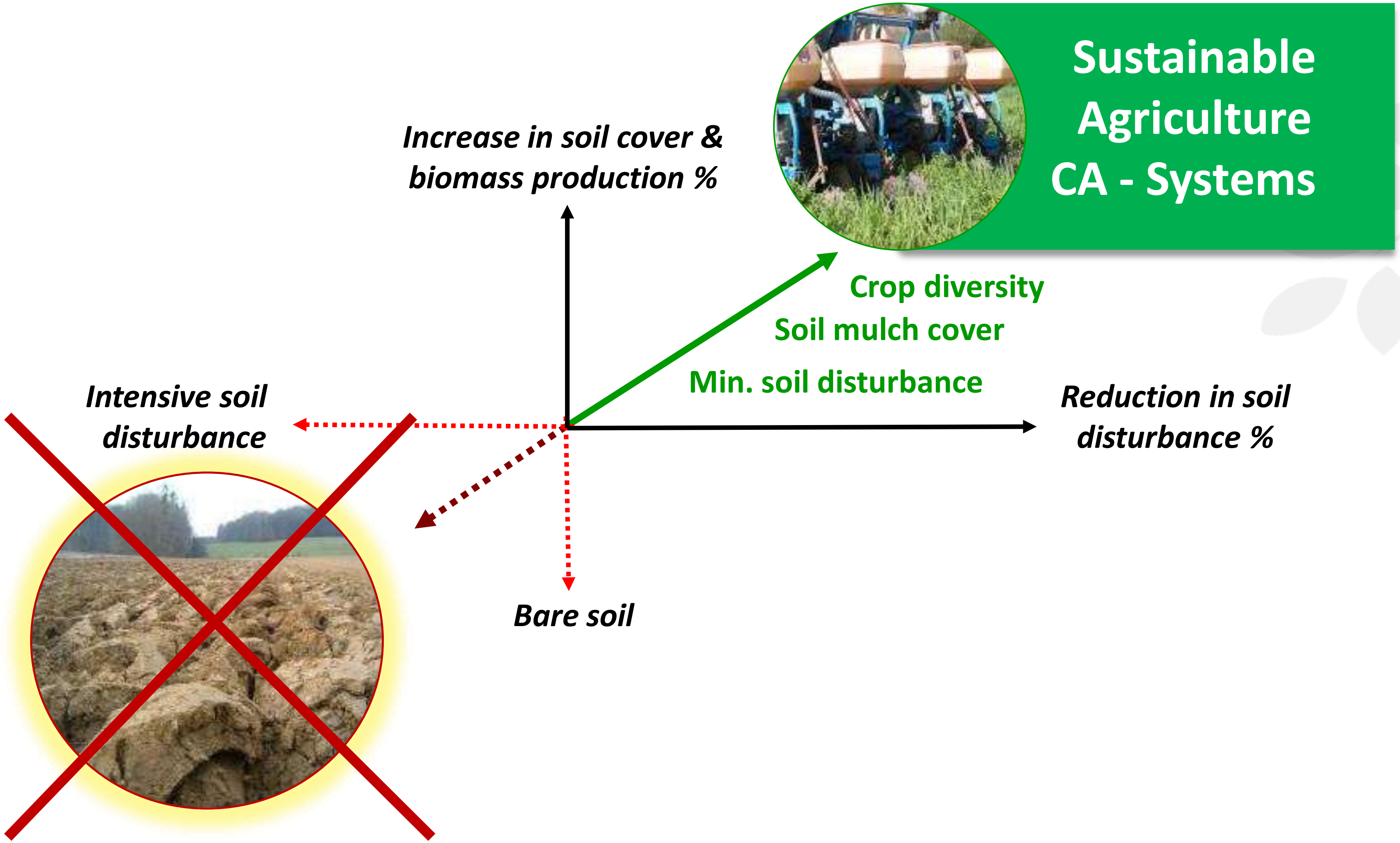
The way forward: Embracing the Future of Farming



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There's a lot to do…

SUSTAINABLE DEVELOPMENT GOALS

EUROPEAN GREEN DEAL

CARBON NEUTRAL

4 POUR 1000

United Nations Convention to Combat Desertification

Convention on Biological Diversity

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Sub-themes of the 8WCCA Congress:

- “Successful experiences and learnings from Conservation Agriculture worldwide”. Prof. Amir Kassam (22 October 2020)
- “Farm and ecosystem level benefits of CA systems to farmers, society and environment”. Dr. Don Reicosky (5 November 2020)
- “Mainstreaming of CA with national policy and institutional support and for global governance to support national and international needs and commitments”. Dr. Tom Goddard (19 November 2020)
- “Promoting CA-based knowledge and innovation systems and information sharing and communication”. Dr. Rachid Mrabet (3 December 2020)

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More Info at:

www.8wcca.org

For further information, contact us:

info@8wcca.org

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Thank you for your attention!

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SWISS NO-TILL