

Soil carbon sequestration as a strategy for climate change mitigation

4 per mille Initiative - Soils for Food Security and Climate

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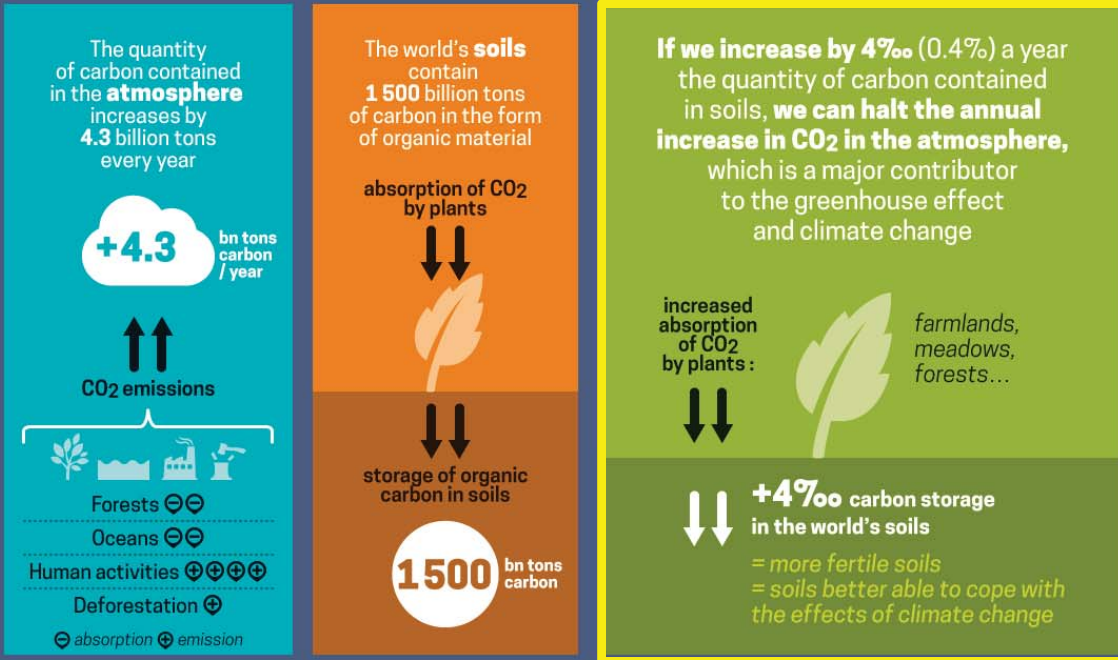
Soil Geography and Landscape Group, Wageningen University



4 PER 1000

CARBON SEQUESTRATION IN SOILS FOR FOOD SECURITY AND THE CLIMATE

Ministère de l'Agriculture, de l'Agroalimentaire et de la Forêt



HOW CAN SOILS STORE MORE CARBON?

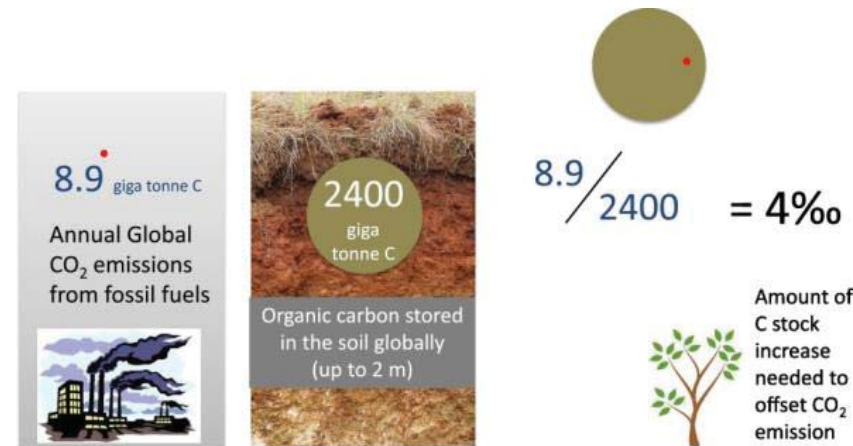
The more soil is covered, the richer it will be in organic material and therefore in carbon. Until now, the combat against global warming has largely focused on the protection and restoration of forests. In addition to forests, we must encourage more plant cover in all its forms.

- Never leave soil bare and work it less, for example by using no-till methods
- Introduce more intermediate crops, more row intercropping and more grass strips
- Add to the hedges at field boundaries and develop agroforestry
- Optimize pasture management - with longer grazing periods, for example
- Restore land in poor condition e.g. the world's arid and semi-arid regions

"This international initiative can reconcile the aims of **food security** and the **combat against climate change**, and therefore engage every concerned country in COP21."

Stéphane Le Foll, French Minister of Agriculture, Agrifood and Forestry

4 per mille Initiative for Food Security and climate



Wageningen UR & 4 per mille



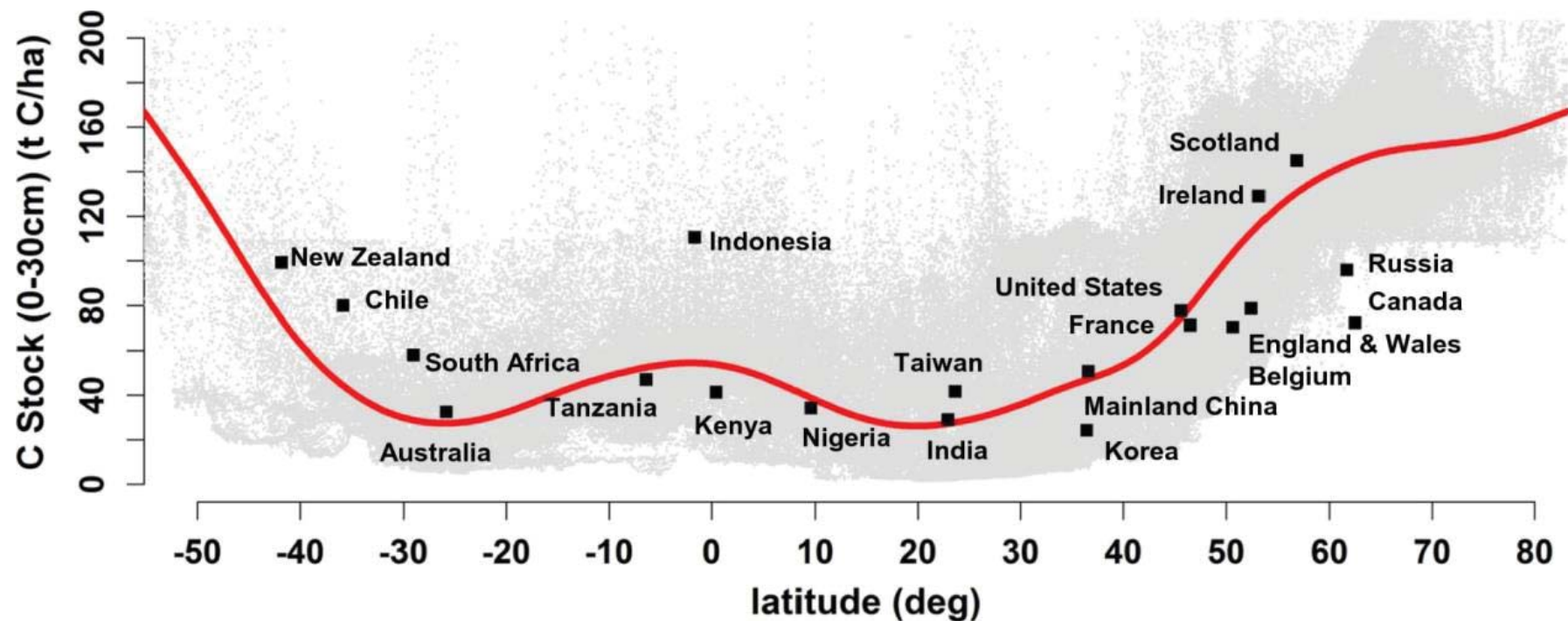
- Climate Smart Agriculture, Sustainable Development Goals
- Wageningen UR has the scientific **expertise and knowledge** at the process level on the behaviour of carbon and organic matter in soils
- National and EU FP7 and H2020 research projects
 - Soil carbon sequestration
 - Soil degradation
 - e.g. AnimalChange, SmartSoil, Catch-C and RECARE and iSQAPER.
- Convey **relevant messages** and provide **quantitative evidence**
- Today: **Identify where** to conserve soil carbon stocks and **where** soil carbon sequestration is most feasible and how easy a 4⁰/₀₀ can be achieved

Soil carbon 4 per mille (Minasny et al., 2017)



■ Review assessment

- 20 regions of the world
- Current SOC stock
- Potentials and challenges for SOC sequestration

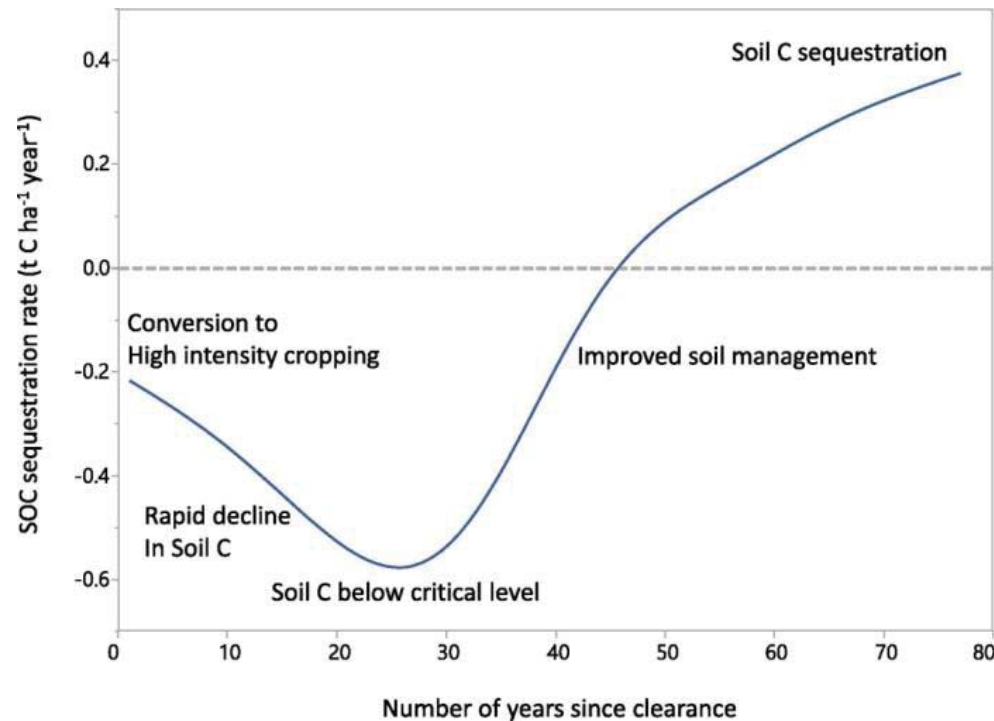


Potentials and challenges in implementing the 4 per mille Initiative



Country/region	Potentials	Challenges
Chile	Afforesting degraded areas Conserving native forest and peatlands	Peatland conversion Limited cropping areas
Australia	Large agricultural area Best management practices	Lack of water Zero or minimum tillage has been implemented almost 80%
Kenya	Best management practices Land restoration	Erosion Rapid expansion of agricultural lands Converting marginal lands into agricultural lands Lack of data
China Mainland	Conservation tillage and straw return Balanced fertilization	Lack of C sequestration data on subsoil Not all cropping areas are under best management practices
France	SOC monitoring Land use changes Best management practices	High soil sealing rate due to urbanisation and infrastructures
Canada	Best management practices Improving degraded land	Development and implementation of innovative practices
Russia	Best management practices on croplands Conversion cropland to grasslands and forest	C loss through cultivation
Scotland	Reducing peatland degradation Forest and agricultural expansion	Large area of peatlands Expansion of intensive agriculture

Regeneration of our agricultural lands



If we consider 4 per mille in the top 1m of global agricultural soils, SOC sequestration is between 2-3 Gt C year⁻¹, which effectively offset 20–35% of global anthropogenic greenhouse gas emissions.

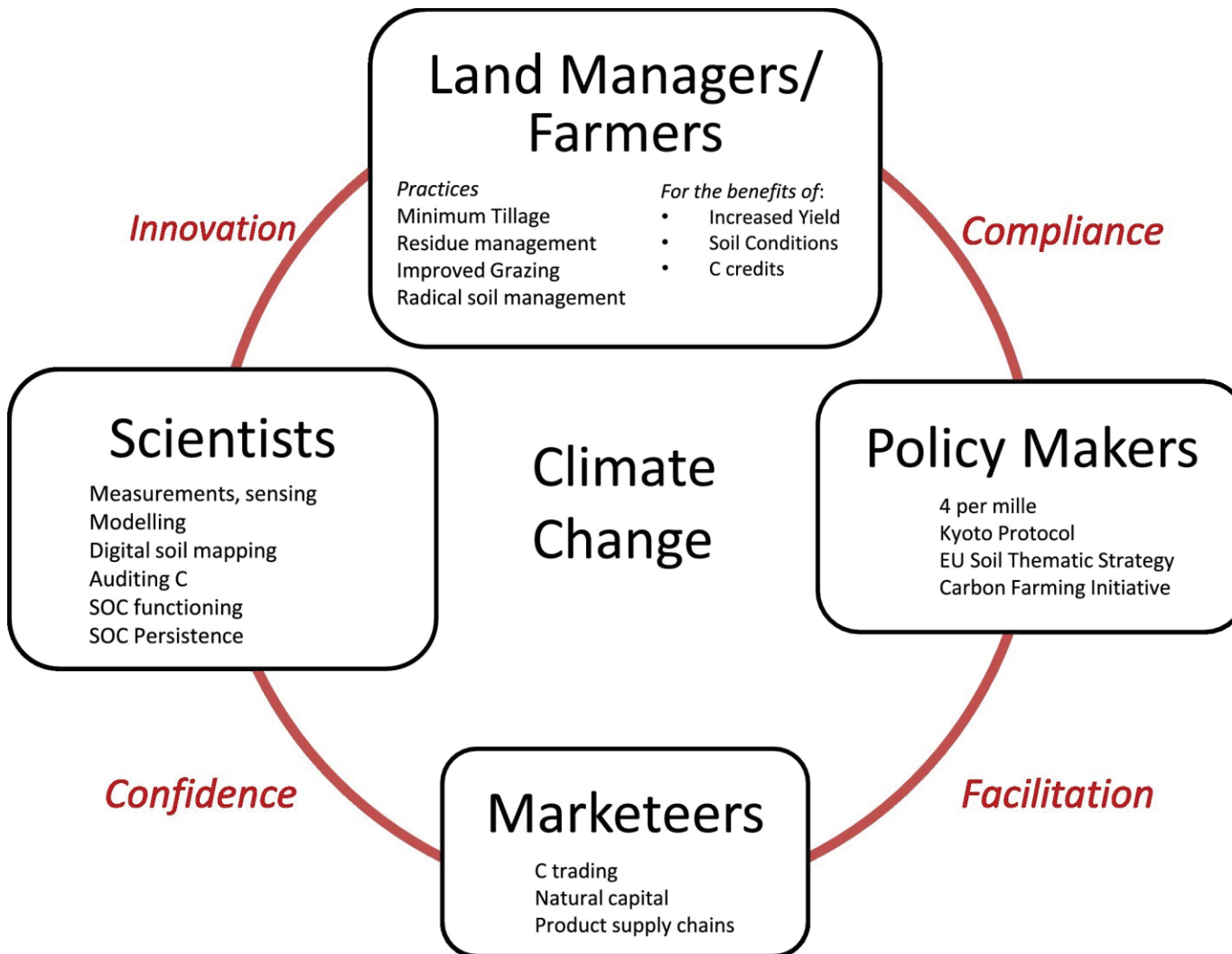
Minasny et al., 2017. Soil carbon 4 per mille. *Geoderma*, 292, pp. 59-86

- TEDx Talks Grand Forks: **Regeneration of Our Lands: A producer's Perspective**, by Gabe Brown <https://youtu.be/QfTZOrnowcc>



Outlook

Soil carbon sequestration can be the solution for mitigating climate change over the next ten to twenty years



References



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