How **Fertilizers Help Protect** and **Capture** Soil Organic Carbon

Soil Organic Carbon (SOC) found in the living matter in soils acts as a sink that **traps and stores CO_2** – a major contributor to global warming.

Soils represent the largest terrestrial pool of carbon: each hectare can store up to **50 - 300 tonnes of carbon**[1], which is equivalent to **180 - 1,100 tons of CO_2**[2]

By increasing crop yields and productivity on available arable land, fertilizers help protect carbon-rich forests, peatlands, wetlands and grasslands by minimizing land use changes.

Increased productivity through fertilizer use has spared **1 billion hectares** of virgin land from cultivation between 1961 and 2005 and saved the equivalent of **317 - 590 billion tonnes of CO_2 emissions** (the same as total global pre-1800 CO_2 emission levels)[3].

Soil could store **1.85 billion** more tonnes of carbon

With better management, farmland soil could also store up to an extra **1.85 billion tonnes of carbon** each year **(7 billion tonnes of CO_2):** around the same amount of CO_2 emitted every year by the global transport sector[4].

The best way to capture more carbon on farmland is to **use fertilizers to optimize plant growth and yields and leave crop residues in the field after harvest.**

For every **2 - 3 tonnes of carbon stored above ground in plants,**

1 or more tonnes of carbon are generally stored below ground in the roots and root exudates.

Combining mineral and organic fertilizers is the most effective way to increase SOC on arable land. Studies have found this can accumulate up to **2 tonnes of carbon per hectare** in a single year[5].

Applying fertilizers following the **4R nutrient stewardship principles** (using the Right nutrient source at the Right rate, at the Right time and in Right place) **enhances nutrient use efficiency,** which **reduces nutrient losses to the environment, including in the form of greenhouse gases.**

Effective and efficient fertilization is a vital part of the climate smart agricultural practices that could **reduce global emissions by 5.5 to 6 billion tonnes of CO_2 equivalent per year:** around the same as removing 1,500 coal-fired power plants from the energy sector[6].

Capturing carbon in soil organic matter represents **89% of agriculture's future mitigation potential,** with 70% of this happening in low- and middle-income countries[7].

To help **fight climate change** we need to use **fertilizers globally to grow more crops on existing farmland** to protect carbon stored in wild ecosystems and **increase the carbon stored in our agricultural soils.**

1 https://www.unccd.int/sites/default/files/documents/Land_In_Numbers_web.pdf
2 One tonne of carbon equals 44/12 = 11/3 = 3.67 tonnes of carbon dioxide.
3 Burney et al. (2010)
4 Zomer et al. (2017)
5 Yang et al. (2016)
6 Smith et al. (2007)
7 Smith et al. (2007)