

# Soil Organic Carbon Guidelines by Rainfall

## Understanding the carbon capacity of your soil

Soil organic carbon (SOC) concentration benchmarks were determined for the South Australian agricultural zone from soil test data for the period 1990-2007 (Schapel *et al* 2021). Benchmarks by soil texture and land use were determined for the State and individual agricultural districts and are reported in separate information sheets. Climatic parameters including rainfall and aridity index were later added to the dataset. Using the benchmarks for common topsoil textures by annual rainfall, the values were smoothed to create the following tables and graphs.

**While the values are the best data currently available for South Australia, they are guidelines only. They have been provided to help farmers and advisors assess if topsoils have the capacity to build additional soil organic carbon.**

*Table 1: Soil organic carbon guidelines for the 0-10cm depth based on annual rainfall zones. The guides are based on the analysis and interpretation of over 35,000 soil samples measured by the Walkley Black laboratory method and presented for key topsoil textures.*

Annual Rainfall (mm)	SANDS				SANDY LOAM			
	Lower limit	Mid point	Practical target	Stretch target	Lower limit	Mid point	Practical target	Stretch target
<300	0.35	0.40	0.50	0.75	0.40	0.60	0.80	1.00
300 - 350	0.50	0.60	0.75	1.00	0.65	1.00	1.25	1.45
350 - 400	0.60	0.75	0.95	1.20	0.75	1.20	1.40	1.65
400 - 450	0.70	0.90	1.20	1.40	0.85	1.30	1.50	1.80
450 - 500	0.85	1.10	1.45	1.80	1.00	1.50	1.80	2.10
500 - 550	1.00	1.30	1.70	2.20	1.20	1.70	2.10	2.50
550 - 650	1.20	1.65	2.20	2.90	1.40	2.10	2.80	3.40
650 - 750	1.30	1.90	2.60	3.40	1.90	2.60	3.60	4.30
> 750	1.40	2.10	2.80	3.60	2.10	2.80	3.80	4.50

Annual Rainfall (mm)	LOAM				CLAY LOAM			
	Lower limit	Mid point	Practical target	Stretch target	Lower limit	Mid point	Practical target	Stretch target
<300	0.50	0.65	0.90	1.20	0.50	0.80	1.20	1.50
300 - 350	0.80	1.00	1.30	1.60	0.80	1.20	1.50	1.80
350 - 400	0.90	1.20	1.50	1.80	1.10	1.40	1.70	2.00
400 - 450	1.00	1.30	1.60	2.00	1.20	1.50	1.80	2.20
450 - 500	1.10	1.50	2.00	2.50	1.25	1.70	2.00	2.50
500 - 550	1.20	1.80	2.40	3.00	1.30	1.80	2.20	2.80
550 - 650	1.50	2.20	3.10	4.00	1.50	2.00	2.60	3.50
650 - 750	2.10	2.80	3.80	4.70	1.90	2.90	3.90	4.80
> 750	2.30	3.00	4.00	5.00	2.20	3.20	4.20	5.00

The SOC guidelines are for the 0-10cm depth and use the Walkley Black (OCWB) laboratory analysis method. The lower limit is based on the 25th percentile, the mid point is the median or 50th percentile, the practical target is the 75th percentile and stretch target is the 90th percentile. The average range is between the lower limit and practical target.

Soils that already have moderate to high SOC values for their given rainfall and soil texture (above practical target) have lower potential to further increase the SOC value. Soils that have low to average SOC values for their given rainfall and soil texture (between lower limit and mid point) have a greater potential to increase the SOC value. To change the SOC value may require identifying and overcoming one or more of the issues outlined in Table 2 and for more detailed management options read the the information sheet The effect of management actions on soil function.

Table 2: Reasons why soil organic carbon values are in the lower or upper part of the average range (between the lower limit and practical target).

<p>SOC values are more likely to be in the lower part of the average range (below the lower limit) if the soil:</p>	<p>SOC values are more likely to be in the upper part of the average range (above the practical target) if the soil:</p>
<ul style="list-style-type: none"> <li>• is shallow</li> <li>• has low inherent fertility</li> <li>• has suffered from soil erosion</li> <li>• has poor management history</li> <li>• has one or more soil constraints (such as acidity, sodicity, compacted layer, water repellence, boron toxicity, high subsoil chloride, high subsoil pH)</li> </ul>	<ul style="list-style-type: none"> <li>• is deep and fertile</li> <li>• has good management history</li> <li>• is calcareous</li> <li>• contains ironstone</li> <li>• has few soil constraints (such as acidity, sodicity, compacted layer, boron toxicity, high subsoil chloride)</li> <li>• is under pasture</li> </ul>

Note that some soils with saline conditions or low pH may have above average SOC values due to low biological activity in the soil.

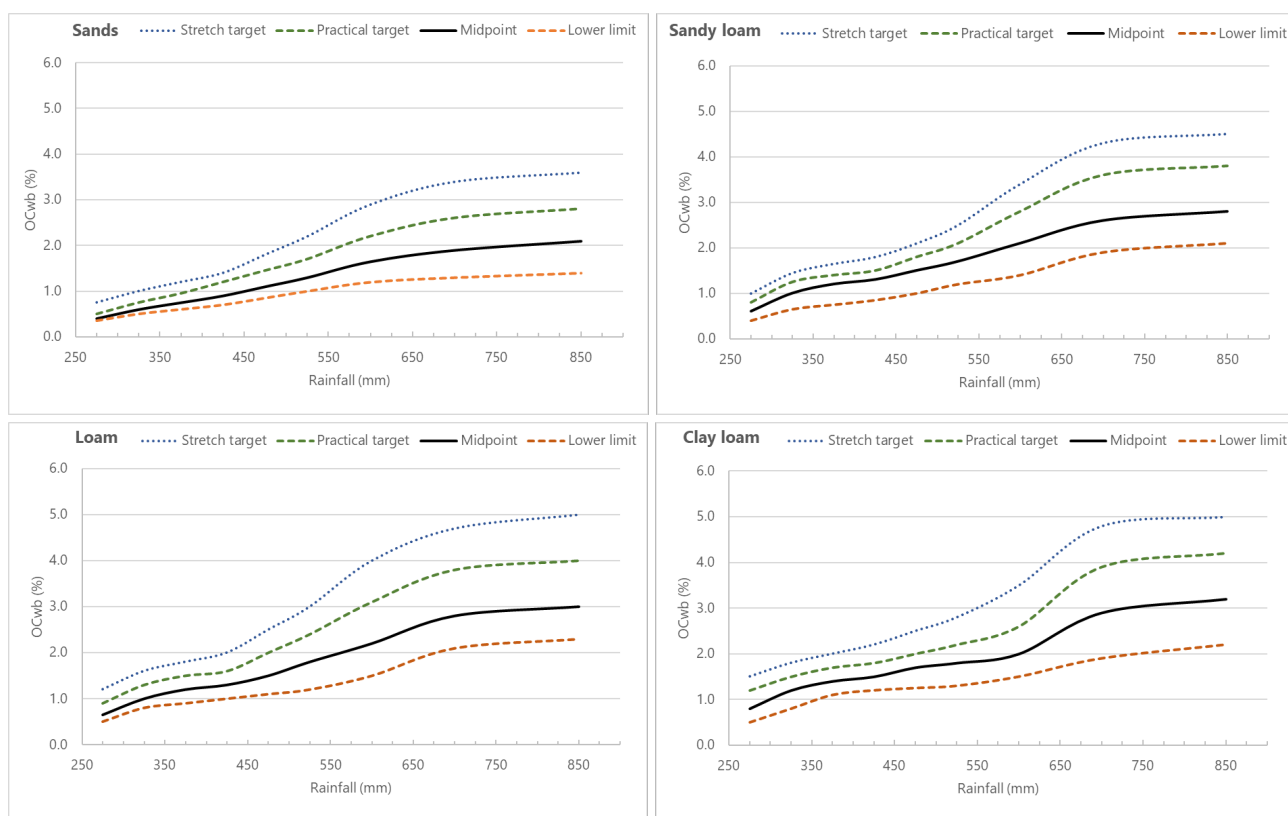


Figure 1. Soil organic carbon guidelines showing the lower limit, mid point, practical target and stretch target for topsoil textures sands (sand and loamy sand), sandy loam, loam and clay loam.

### Reference

Schapel A, Herrmann T, Sweeney S and Liddicoat C (2021). Soil Carbon in South Australia: Volume 4 - Benchmarks and Data analysis for the Agricultural Zone 1990-2007. Soil and Land Hub, Adelaide.

### More information

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