Carbon levels in soil affected by climatic conditions

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Credit: University of Western Australia

Researchers from The University of Western Australia and the Department of Agriculture and Food Western Australia have discovered that hot and dry climatic conditions can limit the organic carbon build up in soil, which can decrease crop productivity and limit measures to offset greenhouse emissions.

Soil can act as both a sink to store carbon from organic matter, or as a source contributing to greenhouse gas emissions as it releases carbon dioxide into the atmosphere through the breakdown of organic matter.

Building soil organic matter means more carbon is stored than lost in this delicate balance, resulting in an increase in the organic content of soil as

well as serving to mitigate potential climate change issues from increased emissions.

Soil organic matter is critical for a number of functions, including providing nutrients to plants, aiding the creation of new soil and increasing the ability of the soil to become more resilient to environmental stresses.

Principal Research Fellow from UWA School of Earth and Environment, Associate Professor Frances Hoyle said the researchers assessed more than 1000 soils across WA to 30 centimetres in depth.

"We found that in conditions where there was less than 450mm of annual rainfall in combination with an average daily temperature of 17.2°C or higher, the ability of the soil to store carbon was significantly decreased," Professor Hoyle said.

"This covered a significant 197,300 square kilometre stretch of land between Geraldton, Moora, Perth and Merredin, which represents 42 per cent of WA's agricultural land."

Professor Hoyle said effects on carbon storage from climatic conditions had future implications for agricultural productivity.

"Farmers will need to consider the implications of changes in long-term climatic conditions to soil quality and adopt management strategies to maximise the return of organic matter to soil and decrease its potential losses," she said.

"The fact that such a large area of the state experiences these climatic conditions suggests there is some risk associated with managing soils specifically for carbon storage.

"The good news is that many of the practices useful for decreasing the risk of carbon loss from soils also support higher profitability through higher yields."

The study has been published in the journal *Scientific Reports*.

More information: Frances C. Hoyle et al. Spatially governed climate factors dominate management in determining the quantity and distribution of soil organic carbon in dryland agricultural systems, *Scientific Reports* (2016). DOI: 10.1038/srep31468

Provided by University of Western Australia