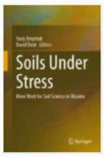
Yuriy Dmytruk
David Dent *Editors*

Soils Under Stress

More Work for Soil Science in Ukraine

Springer



Soils Under Stress pp 3-16 | Cite as

Conceptualizing Sustainable Management of Soil Organic Carbon

Authors | Authors and affiliations

Anatolii Kucher [1] [2]
Email author
View author's OrcID profile

Lesia Kucher [3]
View author's OrcID profile

Antonina Broyaka [4]

1. Department of Ecology and Neoecology, VN Karazin Kharkiv National University, Kharkiv, Ukraine
2. Department of Scientific-Economic Activities, Innovation and Coordination of International Cooperation, NSC Institute for Soil Science and Agrochemistry Research (ON Sokolovsky), Kharkiv, Ukraine
3. Department of Applied Economics and International Economic Relations, VV Dokuchaev Kharkiv National Agrarian University, Kharkiv, Ukraine
4. Department of Economics, Vinnytsia National Agrarian University, Vinnytsia, Ukraine

Abstract

Over the last 50 years, the loss of soil organic carbon has cost Ukraine an average of $US985.6 million (25.2 billion UAH) a year in terms of the capital value of the land. Long-term trends and the current state of the weighted average carbon content in arable soils indicate a worsening situation. Sustainable management of soil organic carbon (SOC) could be a foundation for handling or, even, solving several critical issues including land degradation, sustainable agriculture and climate change. In this context, our holistic concept of sustainable SOC management considers the *goal block*, the *subject-object block*, the *information block*, the *organizational-and-technological block* and the *result block*. For practical implementation, we have developed a conceptual framework for sustainable management of SOC that should deliver a stable level of SOC (not lower than 2010) by 2020 and a gradual increase, by no less than 0.1%, by 2030.

Keywords

Soil organic carbon Sustainable management Climate change Project approach

References

1. Adeyolanu, O.D., and A.O. Ogunkunle. 2016. Soil quality assessment for sustainable land use and management. *International Journal of Plant & Soil Science* 13 (6): 22136.Google Scholar
2. Aleksandrova, L.N., and O. Naidenova. 1976. *Laboratory practice in soil science*. Kolos, Leningrad (Russian).Google Scholar
3. Allan, J.A., M. Keulertz, A.J. Colman, and B. Bromwich, eds. 2019. *The Oxford handbook of water, food and society*. New York: Oxford University Press.Google Scholar
4. Ansong Omari, R., S.D. Bellingrath-Kimura, E. Sarkodee Addo, and others. 2018. Exploring farmers' indigenous knowledge of soil quality and fertility management practices in selected farming communities of the Guinea Savannah agro-ecological zone of Ghana. *Sustainability* 10: 1034. https://doi.org/10.3390/su10041034.
5. Baliuk, S.A., and A.V. Kucher. 2019. Spatial features of the soil cover as the basis for sustainable soil management. *Ukrainian Geographical Journal* 3: 3–14. https://doi.org/10.15407/ugz2019.03.003.CrossRefGoogle Scholar
6. Baliuk, S.A., and V.V. Medvedev (eds.). 2012. *Strategy for sustainable use, restoration and management of soil resources in Ukraine*. Agricultural Science, Kyiv (Ukrainian).Google Scholar

7. Baliuk, S.A., V.V. Medvedev, A.V. Kucher, and others. 2017. Control over soil organic carbon in a context of food safety and climate fluctuation. *Bulletin of Agricultural Science* 9: 11–18. https://doi.org/10.31073/agrovisnyk201709-02 (Ukrainian).

8. Baritz, R., L. Wiese, I. Verbeke, and R. Vargas. 2018. Voluntary guidelines for sustainable soil management: Global action for healthy soils. In *International yearbook of soil law and policy 2017*, ed. H. Ginsky and others. Cham: Springer International. https://doi.org/10.1007/978-3-319-68885-5_3.

9. Boincean, B.P., and D.L. Dent. 2019. *Farming the Black Earth. Sustainable and climate-smart management of Chernozem soils*. Cham: Springer Nature. https://doi.org/10.1007/978-3-030-22533-9.CrossRefGoogle Scholar

10. Boincean, B.P., and D.L. Dent. 2021. An investable proposal for regenerative agriculture across the steppes. In *Regenerative Agriculture. What's missing? What do we still neeed to know?* Cham: Springer Nature.Google Scholar

11. Erşahin, S., S. Kapur, E. Akça, A. Namlı, and H.E. Erdoğan (ed.). 2017. *Carbon management, technologies, and trends in Mediterranean ecosystems*. Cham: Springer International. https://doi.org/10.1007/978-3-319-45035-3_2.

12. FAO. 2017a. *The role of soil organic carbon for climate change and food security*. https://www.fao.org/about/meetings/soil-organic-carbon-symposium/key-messages/ru.

13. FAO. 2017b. *Unlocking the potential of soil organic carbon—Outcome document of the Global Symposium on Soil Organic Carbon (2017)*. Rome: FAO.Google Scholar

14. Helming, K., K. Daedlow, B. Hansjürgens, and T. Koellner. 2018. Assessment and governance of sustainable soil management. *Sustainability* 10: 4432. https://doi.org/10.3390/su10124432.CrossRefGoogle Scholar

15. Iatsuk, I.P. (ed.). 2015. *Periodic report on the state of soil on agricultural land in Ukraine on the results of the 9th round (2006–2010) of agrochemical survey of land*. Kyiv: Soils Protection Institute of Ukraine (Ukrainian).Google Scholar

16. Iatsuk, I.P. (ed.). 2018. *Scientific research on monitoring and survey of Ukrainian agricultural lands by the results of 10th round (2011–2015)*. Kyiv: Soils Protection Institute of Ukraine (Ukrainian).Google Scholar

17. Kapur, E. Akça, and others (ed.). *Carbon management, technologies, and trends in Mediterranean ecosystems*. Cham: Springer International. https://doi.org/10.1007/978-3-319-45035-3_2.

18. Kucher, A.V. 2015a. *Ecological and economic aspects of development of low-carbon agricultural land use*. Kharkiv: Smuhasta typohrafiya (Ukrainian).Google Scholar

19. Kucher, A.V. 2015b. Potential sources of measures financing for reproduction of soil fertility. *Economika APK* 9: 55–59.Google Scholar

20. Kucher, A.V. 2016a. Environmental and economic assessment of CO_2 emissions from soils under different levels of anthropogenic pressure. *Agricultural and Resource Economics* 2 (1): 45–64. https://doi.org/10.22004/ag.econ.256392.CrossRefGoogle Scholar

21. Kucher, L.Y. 2016b. Conceptual approach to economic management of innovation projects of agricultural enterprises. *Visnyk Ekonomichnoi Nauky Ukrainy* 2: 103–106.Google Scholar

22. Kucher, A.V. 2019. *Sustainable soil management in the formation of competitiveness of agricultural enterprises*. Plovdiv: Talent Academic Publishing. https://doi.org/10.13140/RG.2.2.19554.07366.

23. Kucher, L.Y., M. Heldak, and A. Orlenko. 2018. Project management in organic agricultural production. *Agricultural and Resource Economics* 4 (3): 104–128. https://doi.org/10.22004/ag.econ.281753.CrossRefGoogle Scholar

24. Lal, R. 2004. Soil carbon sequestration impacts on global climate change and food security. *Science* 304 (5677): 1623–1627.CrossRefGoogle Scholar

25. Medvedev, V.V. (ed.). 2009. *Irregularity of soils and precision farming. Part 2. Results of research*. Kharkiv: City Typography (Ukrainian).Google Scholar

26. MENRU. 2018. *Protocol no. 1, Meeting of the Coordinating Council on Combating Land Degradation and Desertification*. Ministry of Environment and Natural Resources of Ukraine: https://menr.gov.ua/files/images/news/15062018/Протокол%20КР%20від%2004.05.18.pdf.

27. Osman, K.T. 2018. *Management of soil problems*. Cham: Springer International. https://doi.org/10.1007/978-3-319-75527-4.

28. Powlson, D.S., P.J. Gregory, W.R. Whalley, et al. 2011. Soil management in relation to sustainable agriculture and ecosystem services. *Food Policy* 36 (1): S72–S87. https://doi.org/10.1016/j.foodpol.2010.11.025.CrossRefGoogle Scholar

29. Rojas, R.V., and L. Caon. 2016. The international year of soils revisited: Promoting sustainable soil management beyond 2015. *Environmental Earth Sciences* 75: 1184. https://doi.org/10.1007/s12665-016-5891-z.CrossRefGoogle Scholar

30. Shvidenko, A., I. Buksha, S. Krakovska, and P. Lakyda. 2017. Vulnerability of Ukrainian forests to climate change. *Sustainability* 9 (7): 1152. https://doi.org/10.3390/su9071152 (Ukrainian).

31. Vargas, R., M. Achouri, J. Maroulis, and L. Caon. 2016. Healthy soils: A prerequisite for sustainable food security. *Environmental Earth Sciences* 75: 180. https://doi.org/10.1007/s12665-015-5099-7.CrossRefGoogle Scholar

32. Zdruli, P., R. Lal, M. Cherlet, and S. Kapur. 2017. New World Atlas of Desertification and issues of carbon sequestration, organic carbon stocks, nutrient depletion and implications for food security. In *Carbon management, technologies, and trends in Mediterranean ecosystems*, ed. S. Erşahin, S. Akça, and others. Cham: Springer International. https://doi.org/10.1007/978-3-319-45035-3_2.

Copyright information

About this chapter

Cite this chapter as:

Kucher A., Kucher L., Broyaka A. (2021) Conceptualizing Sustainable Management of Soil Organic Carbon. In: Dmytruk Y., Dent D. (eds) Soils Under Stress. Springer, Cham. https://doi.org/10.1007/978-3-030-68394-8_1

- **DOI** https://doi.org/10.1007/978-3-030-68394-8_1
- **Publisher Name** Springer, Cham
- **Print ISBN** 978-3-030-68393-1
- **Online ISBN** 978-3-030-68394-8