# CEN

# WORKSHOP

# AGREEMENT

# CWA 17898

June 2022

**ICS** 13.080.01

English version

# Methodology to quantify the global agricultural crop footprint including soil impacts

This CEN Workshop Agreement has been drafted and approved by a Workshop of representatives of interested parties, the constitution of which is indicated in the foreword of this Workshop Agreement.

The formal process followed by the Workshop in the development of this Workshop Agreement has been endorsed by the National Members of CEN but neither the National Members of CEN nor the CEN-CENELEC Management Centre can be held accountable for the technical content of this CEN Workshop Agreement or possible conflicts with standards or legislation.

This CEN Workshop Agreement can in no way be held as being an official standard developed by CEN and its Members.

This CEN Workshop Agreement is publicly available as a reference document from the CEN Members National Standard Bodies.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.



EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

**CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels**



Ref. No.:CWA 17898:2022 E

# Contents

Page

## European foreword

This CEN Workshop Agreement (CWA 17898:2022) has been developed in accordance with the CEN-CENELEC Guide 29 "CEN/CENELEC Workshop Agreements – A rapid prototyping to standardization" and with the relevant provisions of CEN/CENELEC Internal Regulations - Part 2. It was approved by a Workshop of representatives of interested parties on 2022-06-06, the constitution of which was supported by CEN following the public call for participation made on 2022-03-02. However, this CEN Workshop Agreement does not necessarily include all relevant stakeholders.

The final text of this CEN Workshop Agreement was provided to CEN for publication on 20222-06-07.

Results incorporated in this CWA received funding from the program Retos-Colaboración 2017, funded by the Spanish Ministry of Science, Innovation and Universities under grant agreement No. RTC-2017-5887-5 (project FERTILIGENCIA).

The following organizations and individuals developed and approved this CEN Workshop Agreement

- Ms. Bárbara Palacino, Spain - Chairperson
- UNE, Spain, Ms. Rosa Cepas - Secretary
- BIO3G, France, Mr. Olivier Klarzynski
- Düngekalk Hauptgemeinschaft in BVK, Germany, Mr. Reinhard Müller
- Fertinagro Biotech, Spain, Ms. Victoria Cadahía
- Fertinagro Fertesa, Spain, Ms. Azucena Mainar
- Fertinagro Nutrigenia, Spain, Mr. Marcos Caballero
- Fundación Circe, Spain, Ms. Sonia Ascaso
- Hello Nature International, Italy, Mr. Benoît Planques and Ms. Erica de Benedetti
- Institute of Environmental Engineering of the Polish Academy of Science, Poland, Ms. Irena Twardowska and Mr. Sebastian Stefaniak
- NEN, Netherlands, Ms. Marleen Schoemaker
- Parque Tecnológico Aula Dei, Spain, Mr. Manuel Márquez
- Universidad de Zaragoza, Spain, Ms. Alicia Valero

# Introduction

Loss of soil fertility and soil erosion are some of the threats facing mankind. Agricultural systems are complex systems made up of physical, chemical, and biological properties. Soil parameters or factors constitute these properties. A large number of factors involved in the cycles and processes occurring in the soil makes it necessary to study them using different parameters. Due to the complexity of soils, there is currently no consensus on how to assess loss of soil fertility and soil erosion, and they are not included in the usual environmental impact assessment methodologies.

This CWA proposes to use the exergy methodology to evaluate all the impacts of an agroecosystem, including those occurring in the soil. Exergy is a physical property based on the second law of thermodynamics and unifies into a single indicator; all soil parameters relevant for soil fertility assessment.

This CWA is an opportunity to further improve soil quality evaluation by introducing a thermodynamic indicator that will contribute to a rigorous assessment of agricultural processes' impact. The determination of a single comparable, reliable, accurate, and globally accepted indicator will be essential in the near future for the evaluation of soil fertility and agricultural processes efficiency and environmental sustainability.

# 1 Scope

This European CWA specifies a methodology for identifying, characterizing, and implementing a single indicator to assess the quality and degradation of agricultural soils and the overall impact of the agriculture processes. The agriculture impacts are assessed through the mechanical, fertilization and irrigation activities associated. Furthermore, soil impacts is evaluated accounting with soil erosion and parameters such as nutrients, texture, and organic matter. The developed methodology allows a simple but robust assessment of soil biogeochemical processes and the loss of fertility and degradation.

This European CWA also provides, in Annexes A and B, informative guidance on its use.

# 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 20951:2019, *Soil Quality — Guidance on methods for measuring greenhouse gases ($CO_2$, $N_2O$, $CH_4$) and ammonia ($NH_3$) fluxes between soils and the atmosphere*

ISO 11063:2020, *Soil quality — Direct extraction of soil DNA*

# 3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

**3.1**
**exergy**
the maximum amount of work that may theoretically be performed by bringing a resource into equilibrium with its surrounding environment by a sequence of reversible processes

The exergy of a system gives an idea of its evolution potential for not being in thermodynamic equilibrium or dead state with the environment. Unlike mass or energy, exergy is not conserved but destroyed by irreversibilities and lost in all physical transformations until the system reaches a dead state.

Exergy is an extensive property with the same units as energy.

**3.2**
**eco-exergy**
the working capacity of organisms due to the genetic information they possess [1]

**3.3**
**crop exergy footprint**
**CEF**
the energy required, considering the irreversibility of the different processes, to carry out the different activities involved in the agricultural process