TDE-P01 | Legacy Pesticides in Soil

Experimental selection criteria · Chapter 3 · Version 0.1 · 7 November 2026

Technical document of TrustyFood – Lands of Excellence. It defines a criterion for the twelve plant-protection products listed in Annex 2 of Ministerial Decree 46/2019, and explains its basis in European evidence. It is neither a certification nor a health-based threshold.

1. Purpose and approach

A restricted panel of the 12 plant-protection products listed as items 25–36 in Annex 2 of Ministerial Decree 46/2019 is adopted, avoiding routine use of a food-oriented multi-residue panel of more than 500 substances on soil. The regulatory list is an operational starting point, not an exhaustive inventory of the most persistent pesticides; substances such as alachlor and atrazine have different persistence from legacy organochlorines.

TDE soil monitoring assesses the footprint of residues in the soil and does not replace analyses of agricultural products. Possible biological checks provide additional evidence of occurrence or accumulation in selected matrices and do not remove applicable environmental obligations.

2. Analyte list and regulatory comparison

Decree item	Analyte	CSC (Decree 46/2019)	Direct TDE threshold
25	Alachlor	0.010 mg/kg dry matter	< 0.005 mg/kg dry matter
26	Aldrin	0.010 mg/kg dry matter	< 0.005 mg/kg dry matter
27	Atrazine	0.010 mg/kg dry matter	< 0.005 mg/kg dry matter
28	α-hexachlorocyclohexane	0.010 mg/kg dry matter	< 0.005 mg/kg dry matter
29	β-hexachlorocyclohexane	0.010 mg/kg dry matter	< 0.005 mg/kg dry matter
30	γ-hexachlorocyclohexane (lindane)	0.010 mg/kg dry matter	< 0.005 mg/kg dry matter
31	Chlordane	0.010 mg/kg dry matter	< 0.005 mg/kg dry matter
32	DDD	0.010 mg/kg dry matter	< 0.005 mg/kg dry matter
33	DDT	0.010 mg/kg dry matter	< 0.005 mg/kg dry matter
34	DDE	0.010 mg/kg dry matter	< 0.005 mg/kg dry matter
35	Dieldrin	0.010 mg/kg dry matter	< 0.005 mg/kg dry matter
36	Endrin	0.010 mg/kg dry matter	< 0.005 mg/kg dry matter

Units: 0.005 mg/kg = 5 µg/kg = 5 ppb; 0.010 mg/kg = 10 µg/kg = 10 ppb. The criterion applies to each of the 12 analytes, not to their sum. For isomers, metabolites and technical mixtures the laboratory must state exactly how the reported result is defined, consistently with the regulatory parameter.

3. TDE decision rule

Result X for each analyte	TDE criterion outcome
X < 0.005 mg/kg	PASSED: continue with other TDE criteria
0.005 ≤ X ≤ 0.010 mg/kg	SUSPENDED: compare with results from relevant biological matrices
X > 0.010 mg/kg	NOT PASSED: exclusion under the TDE criterion

To ensure unambiguous classification, a result exactly equal to 0.005 or 0.010 mg/kg lies within the suspended band. This convention is part of the TDE operational criterion. Any substance in the intermediate band keeps the overall assessment suspended pending completion of relevant biological checks.

In the intermediate band, the criterion will be met only if the selected bioindicators comply with their respective thresholds, which must be defined and validated in a later section. Soil mg/kg and biological-tissue mg/kg must not be compared numerically as though they were equivalent quantities.

4. Analytical requirements before implementation

To make the direct < 0.005 mg/kg criterion feasible, the laboratory must demonstrate, in the soil matrix, an LOQ ≤ 0.005 mg/kg for each analyte, with validated methodology, blanks, recoveries, measurement uncertainty and documented calculation rules. Availability of the same LOQ in food does not automatically guarantee its applicability to soil.

If a result is reported as "< LOQ" and LOQ ≤ 0.005 mg/kg, the direct criterion may be met. Results exactly at the LOQ, positives in the intermediate band and uncertainty near the boundaries require a predetermined confirmation procedure; they must not be interpreted at discretion.

5. Relevant European scientific evidence

Source and population	Quantitative evidence	Interpretation of 5 µg/kg criterion
JRC — LUCAS 2018; 3,473 EU agricultural soils; 118 substances/metabolites	Quantifiable residues at 74.5% of sites; ≥2 residues at 57.1%.	Traces in agricultural soils are common. Does not measure exceedance of 5 µg/kg for the 12 TDE analytes.
EURO-SOILS — 6 European soils; organochlorine pesticides	p,p′-DDT: 0.03–0.13 µg/kg; p,p′-DDD: 0.01–0.12; p,p′-DDE: 0.04–1.36; ΣDDT 0.10–1.58; reported ΣHCH 0.17–2.84.	The individual compounds reported were below 5 µg/kg in these six samples; sample too small for a universal limit.
Poland — 142 organic fields, 2020 study	ΣDDT (isomers + metabolites): 5–383 µg/kg in positive fields; mean 64 µg/kg; >80% positive.	Shows legacy residues even in organic farming. ΣDDT is NOT directly comparable with the per-analyte TDE limit.

Overall interpretation: 5 µg/kg per substance is a selective voluntary threshold, plausible as a preliminary screening criterion, but not a universally safe ecotoxicological limit. Literature reports soils with residues well below that value and others with higher legacy residues, including organic soils. Acceptance in the 5–10 µg/kg band must therefore depend on specific biological checks, not merely on compliance with the CSC.

6. Limitations and outstanding issues

• Validation of the LOQs for all 12 analytes in soil and treatment of uncertainty at threshold values.

• Selection of suitable biological matrices for different substances and their respective TDE limits; for legacy bioaccumulation, earthworms are one possible matrix, not a universal answer.

• Potential investigations of mixtures and other residues outside the list (e.g. current-use pesticides and metabolites), in a separate module based on local pressures.

• Regulatory obligations: the TDE threshold is voluntary; exceedance of a CSC requires a separate assessment under applicable legislation.

7. Verifiable sources and documents

[1] Ministerial Decree of 1 March 2019, No. 46, Annex 2, plant-protection products 25–36. https://www.reteambiente.it/normativa/34835/dm-ambiente-1-marzo-2019-n-46/

[2] JRC / EU Soil Observatory, Pesticide residues in EU agricultural soils based on LUCAS. https://esdac.jrc.ec.europa.eu/themes/pesticides-residues-eu-agricultural-soils-based-lucas

[3] JRC, EURO-SOILS, Table 1 (six soils). https://esdac.jrc.ec.europa.eu/ESDB_Archive/eusoils_docs/other/EUR19460.pdf

[4] Malusá et al. (2020), Monitoring of DDT in Agricultural Soils under Organic Farming in Poland and the Risk of Crop Contamination, Environmental Management 66, 916–929. https://doi.org/10.1007/s00267-020-01347-9

[5] JRC, Evaluation of the ecological risk of pesticide residues from the European LUCAS Soil monitoring 2018 survey. https://publications.jrc.ec.europa.eu/repository/handle/JRC134664

Status: voluntary TDE criterion subject to practical verification. Bioindicator thresholds will be defined in subsequent documents.