EURACHEM WORKSHOP 2026

Are naturally contaminated matrices suitable as proficiency testing materials?

Evidence from food microbiology and organic-fertilizer analyses

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PT usually rely on **artificial, stabilized or lyophilized** materials, valued for homogeneity and shelf life. If theses samples behave differently from the fresh, complex samples analyzed in routine, their use raises questions of **commutability and representativeness**. For three decades, REQUASUD has built its various PT schemes on **fresh and naturally contaminated matrices**, with an adapted methodology.
This methodology is explained via two contrasting case-study domains: food microbiology and the mineral & organic analysis of organic fertilizers.

FOOD MICROBIOLOGY
Naturally *vs* artificially contaminated food samples

Since 1991 · 26 participants · 2 PT / year

MATRICES

Naturally contaminated matrices with inocula: smoked salmon, ham sausage, raw milk, cake. Control: sterile milk with inocula.



PARAMETERS

14 enumerations: Total aerobic flora, *E. coli*, *Campylobacter*, yeasts, molds, *L. monocytogenes*, …
3 detections: *Salmonella* spp, *L. monocytogenes, E. coli* O157:H7.

ORGANIC FERTILIZERS
Walloon farm fertilizers

Since 1998 · 7 participants · 2 PT / year

MATRICES

Fresh slurry, manure and digestate (≥250 g solid / 1 L liquid); occasionally pelletized fertilizers, scums, compost.



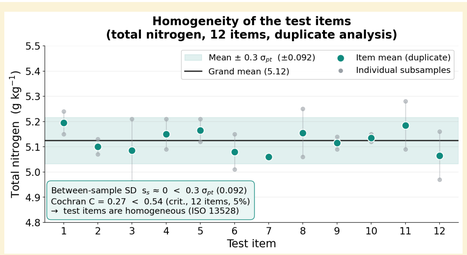
PARAMETERS

Mineral & organic composition: dry matter, organic matter, total & ammoniacal nitrogen, phosphorus, potassium, calcium, magnesium, sulphur, copper, zinc, ash.

Handling the challenges of natural matrices

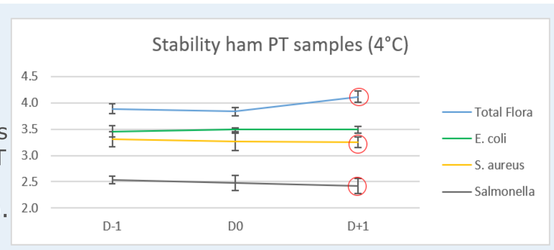
Homogeneity

Between-sample SD < 0.3 σ_{pt} for every measurand: homogeneity was fully validated.



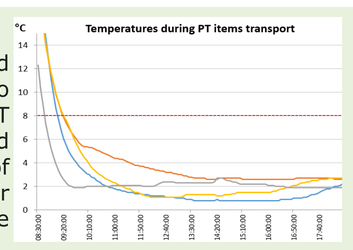
Stability

Some microbial parameters drift by day +1: participants must analyze the PT items at Day 0 (the day after reception).



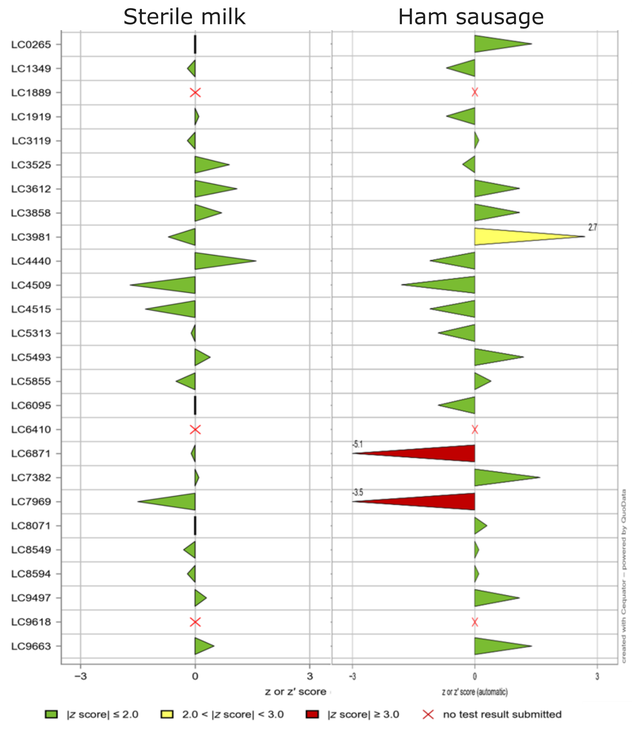
Cold-chain logistics

Fresh items are shipped refrigerated (< 8 °C) using 4 transporters to reach the 26 labs within one day. PT samples are analysed on an imposed date, reflecting the constraints of routine samples analyses, rather than the convenience of stable powder samples.



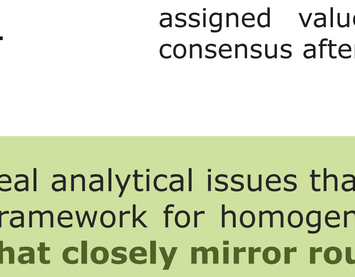
Results: one methodology for two contrasting domains

1 · Natural *vs* artificial variability · Microbiology



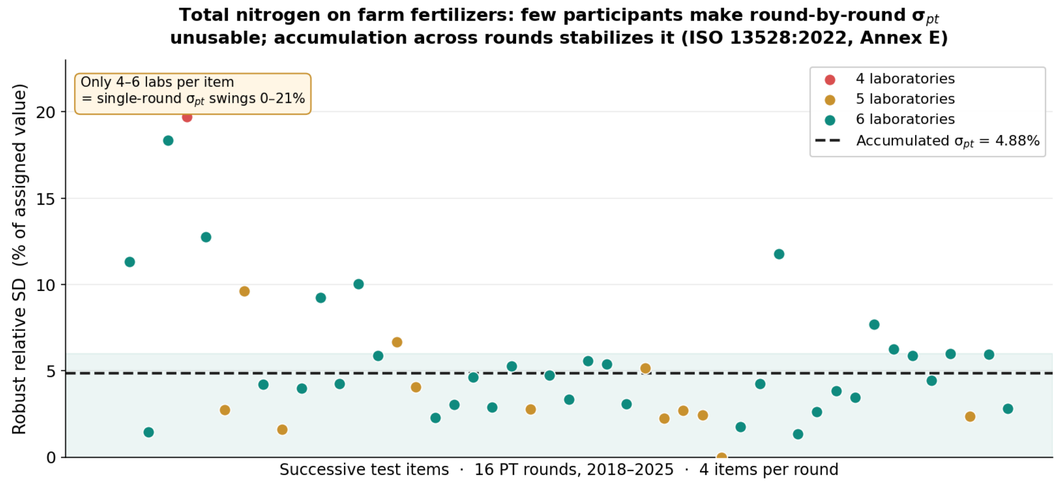
The PT schemes include both naturally contaminated and artificial samples. The variability of the labs' results is systematically higher in the natural samples, as illustrated here (z-scores for the enumeration of total aerobic flora in sterile spiked milk and naturally contaminated ham samples during PT 2026).

The enumeration of total flora on PCA agar (picture below) is more arduous in the presence of a natural flora.



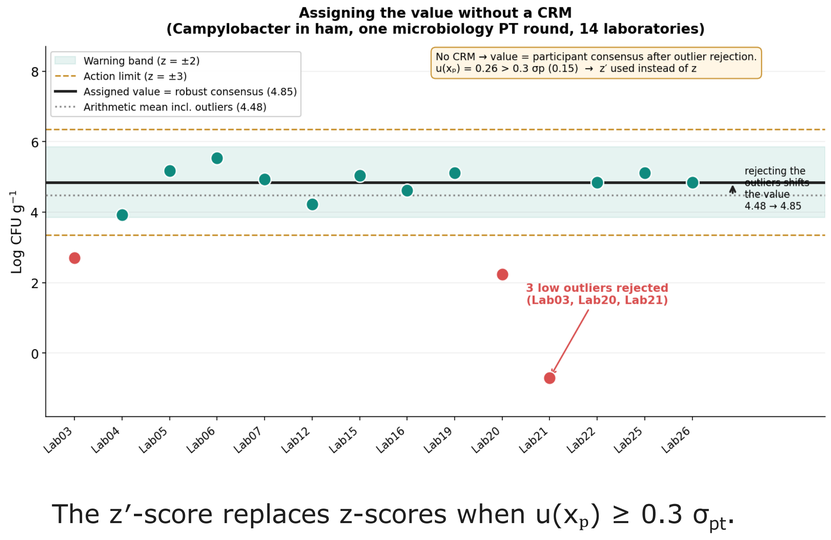
Sterile milk Ham sausage

2 · Robust σ_{pt} from few participants · Fertilizers

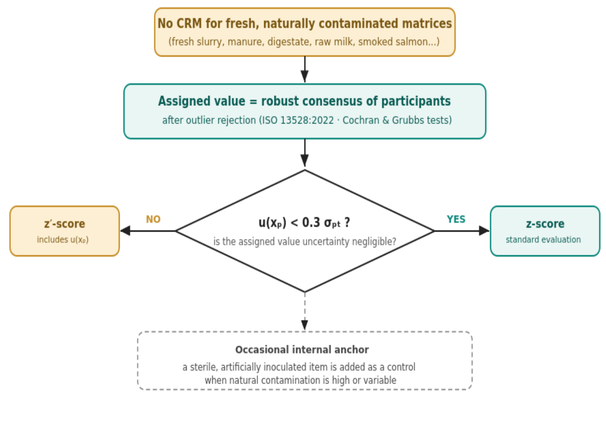


With only 4 to 6 laboratories per round, a single-round σ_{pt} swings from 0 to 21 %. Accumulating at least 6 rounds (ISO 13528:2022, Annex E) delivers a stable, fit-for-purpose σ_{pt} for total nitrogen (about 5 %).

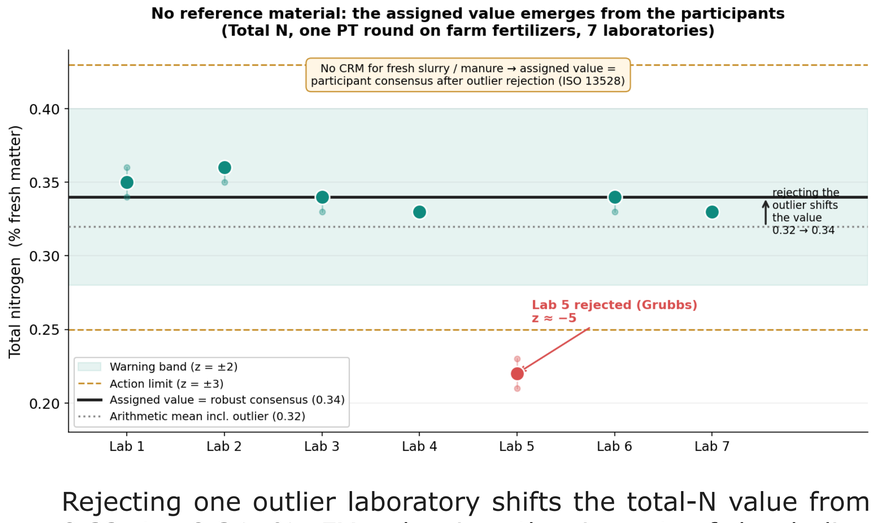
3 · Setting the assigned value without a reference material · both schemes



The z'-score replaces z-scores when $u(x_p) \geq 0.3\ \sigma_{pt}$.



Method: in the absence of natural CRM, the assigned value is the participants' robust consensus after outlier rejection.



Rejecting one outlier laboratory shifts the total-N value from 0.32 to 0.34 % FM, showing the impact of borderline laboratories on the assigned value.

PT schemes with real-life, fresh matrices, reveal analytical issues that could otherwise remain unnoticed: their use avoids a systematic underestimation of analytical variability. Within a controlled framework for homogeneity, stability and assigned-value determination, naturally contaminated matrices are **robust, fit-for-purpose PT materials that closely mirror routine conditions** – a practical alternative to stabilized materials.

PT providers should consider including at least one fresh natural sample in their schemes.

www.requasud.be · Schemes per ISO/IEC 17043

Avec le soutien de la Wallonie