



Proven Technologies for Circular Nutrient Management & Livestock Waste Valorization in Europe

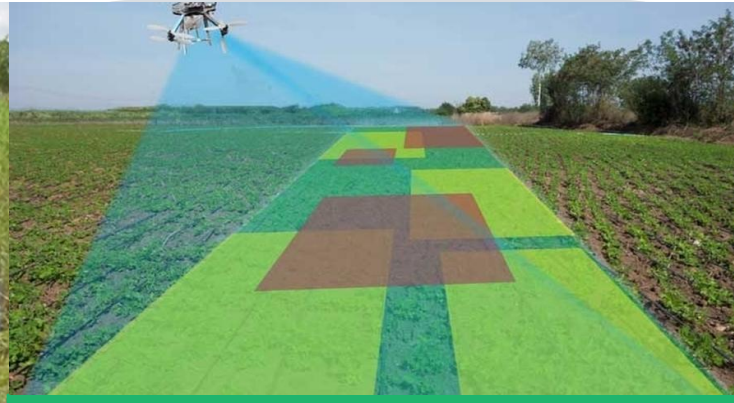
ManuREsource 2026 • 15-minute conference talk

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Conference theme focus: Manure as a resource, sustainability, and innovations in treatment.



Topic 1
Manure as resource

- Fertiliser & soil enhancer
- Fuel & materials
- Growth substrate

Topic 2
Manure & sustainability

- Policy impact
- Emissions
- Precision farming

Topic 3
Innovations in treatment

- Digestate processing
- N & P recovery
- New value chains

FERTITEC snapshot

- Horizon Europe CSA | Grant Agreement 101181513
- Duration: 1 Jan 2025 – 31 Dec 2027 (*now in Year 2*)
- Consortium: 7 organisations across 6 countries

Sweden, Greece, Finland, Spain, Poland, Kenya; coordinated by RISE Research Institutes of Sweden AB

What we're building: FERTITEC Knowledge Exchange Platform + AI-powered EcoFerti tool (decision support) (fertitec-project.eu)

Sister CSA: FertiCovery

FERTITEC contributes a Europe-wide evidence base on mature nutrient recovery & manure/digestate valorisation pathways.

Why nutrient circularity matters

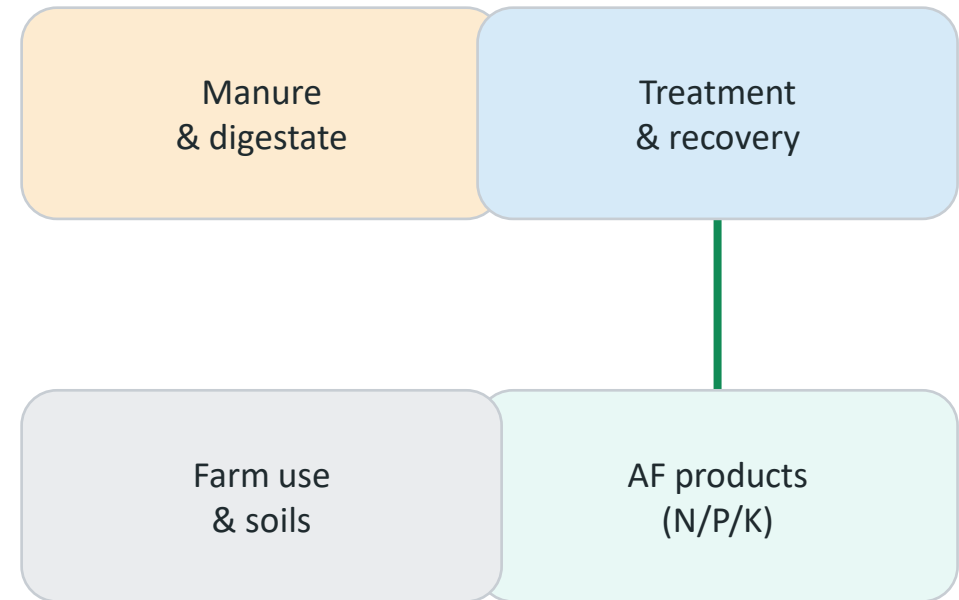
- Europe is scaling solutions that:
- recover N, P and K from manure/digestate and other secondary streams
- reduce reliance on mineral fertilisers
- turn waste management into value chains (products + services)

Manure and digestate are not only waste streams; they are major nutrient carriers.

The motivating idea of nutrient circularity is a simple loop: recover nitrogen, phosphorus, and potassium from manure/digestate and other secondary streams, and return them to agriculture in usable forms.

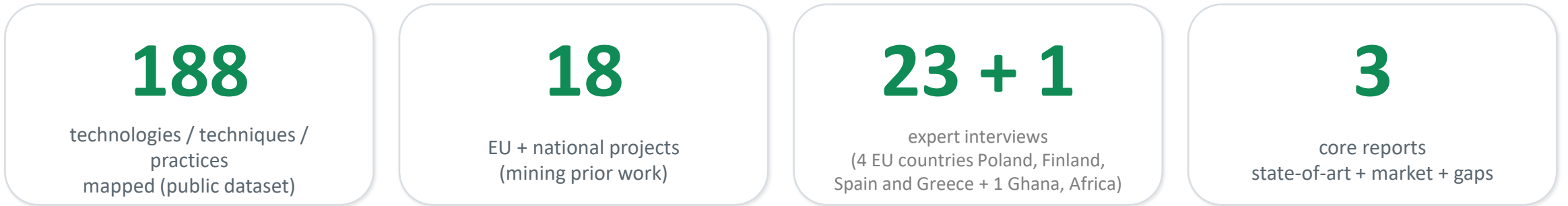


A simple value-chain view

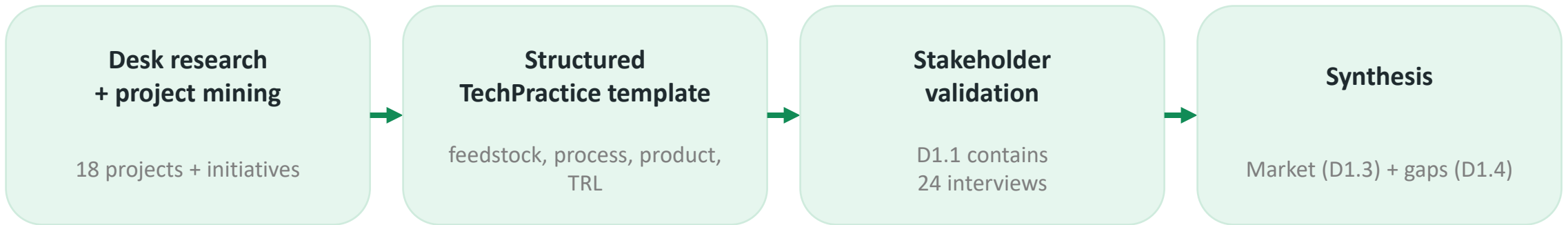


FERTITEC maps the technologies that make this loop work — and the barriers holding it back.

A CSA project building an actionable picture of “what works” for alternative fertilisers (AF) in Europe.

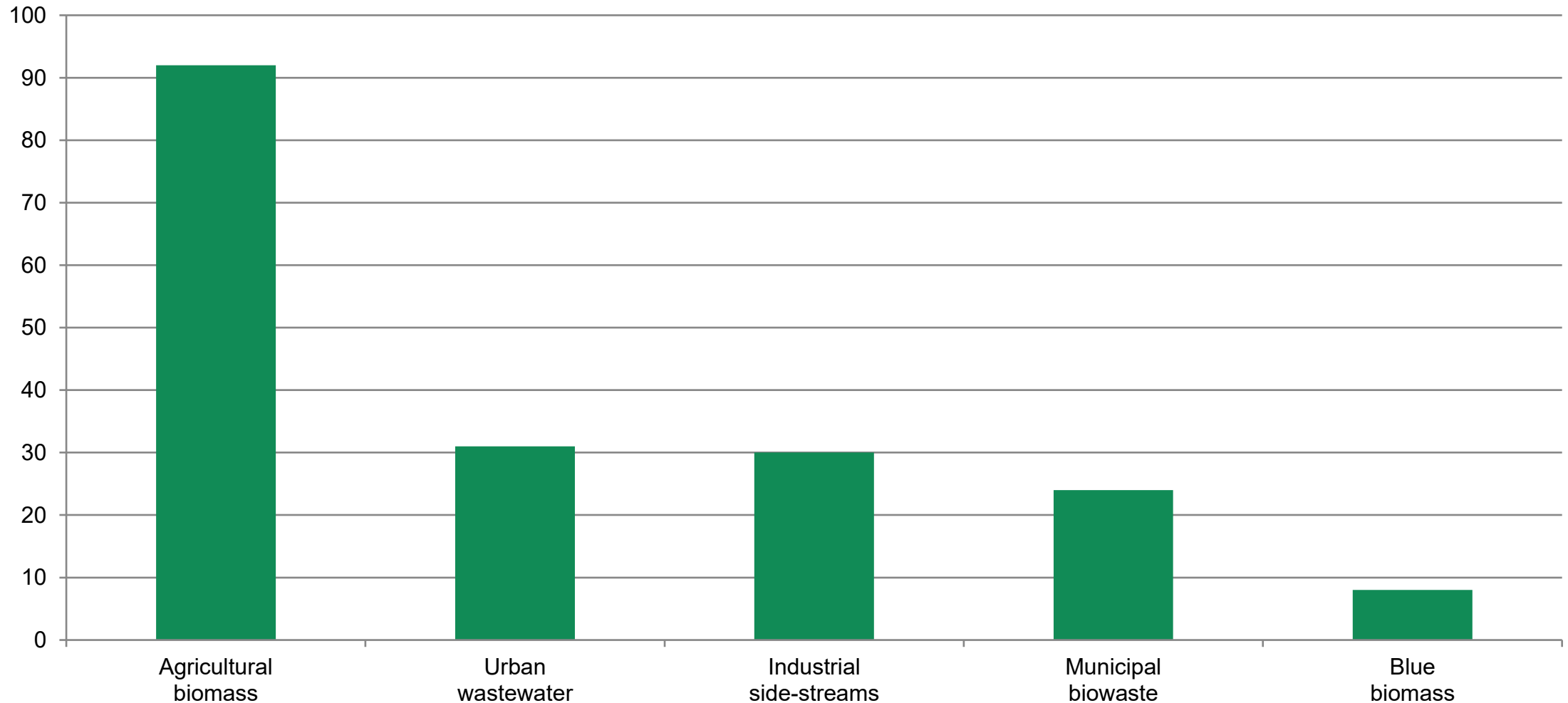


How the mapping works



Open Access reports from FERTITEC at <https://fertitec-project.eu/deliverables/>

Agricultural biomass dominates the mapped solutions; wastewater, industrial side-streams and municipal biowaste also feature strongly.



Across Europe, the most frequently referenced and mature approaches cluster into a few repeatable families.

Anaerobic digestion + digestate valorisation

- biogas + nutrient products
- separation, concentration

Composting & aerobic stabilisation

- hygienisation
- organic soil improvers

Chemical recovery

- struvite precipitation
- ammonia stripping/scrubbing

Membranes & separations

- filtration / RO
- concentrates for transport

Thermal pathways

- pyrolysis → biochar
- advanced options

Mapped products are recorded against EU Fertilising Products Regulation categories (PFC).

Organic

composts, digestate-based products, soil improvers

Organo-mineral

blended concentrates for balanced nutrition

Inorganic

recovered mineral forms (e.g., struvite, ammonium salts)

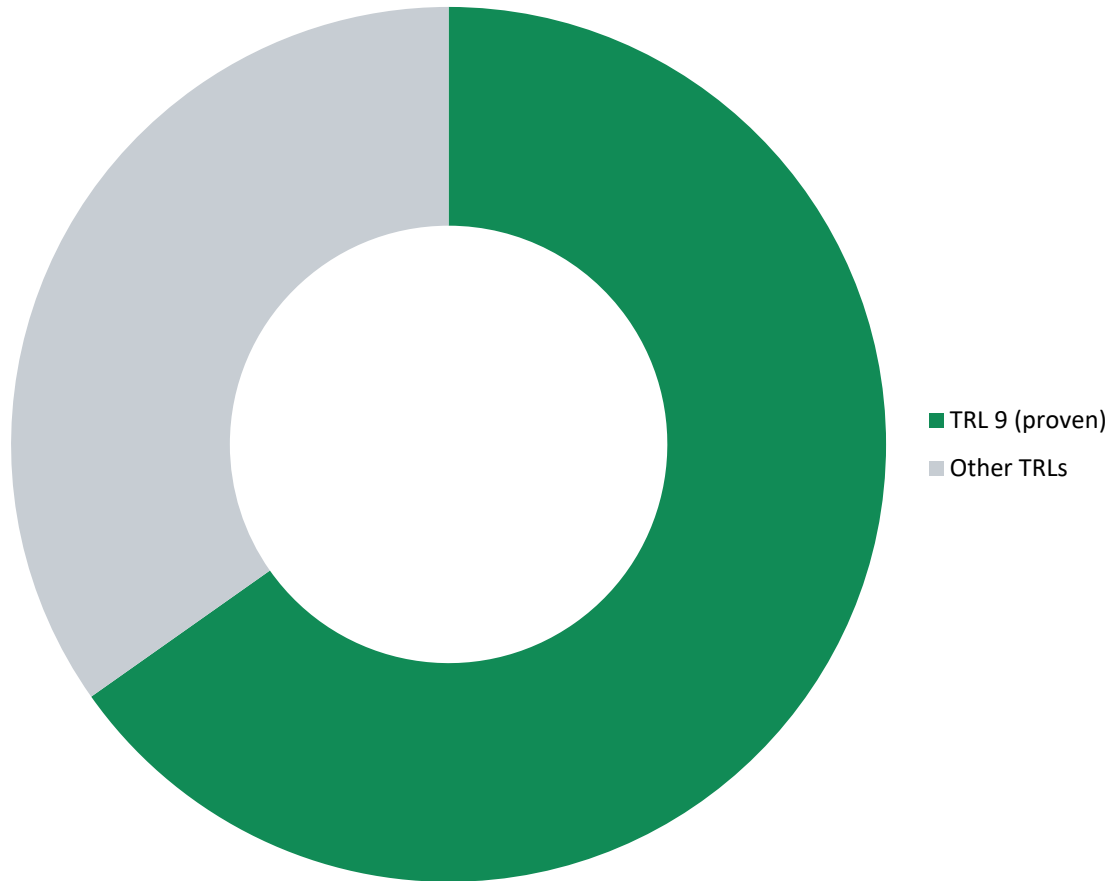
Patterns observed in the mapping

- Urban wastewater solutions often yield inorganic fertilisers via nutrient recovery
- Municipal biowaste frequently yields organo-mineral products
- Other streams are dominated by organic products

Implication for practitioners:

Choose treatment routes based on target market (organic farming vs mineral replacement), local logistics (distance), and regulatory pathway.

Most mapped solutions are already operating in real environments.



65%

of mapped practices are at TRL 9 (≈120 of 184).

Bottlenecks are often institutional and market-related — not purely technical.

Low-/mid-TRL remains important

TRL 3–6 is reported as a small minority (≈10%) — a pipeline for future upgrades and cost reductions.

Across D1.3 and D1.4, the dominant barriers are regulatory fragmentation, costs, variable feedstock quality, logistics, and end-user confidence.

Key drivers

- EU & national circular economy / soil protection policies
- Technology advances (e.g., AD, struvite, ammonia recovery)
- Rising mineral fertiliser prices → interest in alternatives
- Local value chains (shorter supply chains)
- Organic farming expansion + voluntary standards
- Better data tools for siting and feedstock assessment

Key barriers

- Regulatory inconsistency (waste definitions, end-of-waste status)
- Complex permits, slow legal adaptation to innovation
- High CAPEX/OPEX; viable mainly at larger scale
- Variable feedstock composition + contaminants → QA burden
- Low nutrient concentration of liquids → high transport costs
- Low awareness / trust; weak labelling & certification in practice

Expert-weighted SWOT suggests a “maxi–mini” (conservative) strategy: leverage strengths while actively managing external threats.

<p>Competitive (mini–maxi)</p>	<p>Aggressive (maxi–maxi)</p>
<p>Defensive (mini–mini)</p>	<p>Conservative (maxi–mini)</p> <p style="text-align: center;">● FERTITEC position</p>

What this means

Strengths to leverage

- high availability of waste biomass
- standards/regulations enable safe marketing

Threats to manage

- complex legal requirements (end-of-waste, registration)
- dominance of mineral fertilisers
- trust/knowledge gaps

Use-cases drawn from the mapped families (AD, separation, nutrient recovery, thermal options).

A) AD + separation + ammonia recovery

- Manure → AD
- Digestate separation
- Stripping/scrubbing
- Ammonium salt + fibre

Outputs: biogas + ammonium sulphate/nitrate + solid fertiliser/soil improver

B) P recovery as struvite

- Digestate / WW liquor
- Mg dosing + precipitation
- Crystal harvesting
- Granular fertiliser

Outputs: struvite (slow-release P) + cleaner effluent

C) Thermal: pyrolysis → biochar

- Separated solids
- Drying
- Pyrolysis
- Biochar conditioning

Outputs: carbon-rich soil enhancer + potential nutrient blends

1) The tech is largely ready — scale-up is mainly about enabling conditions.

- Prioritise regulatory clarity (end-of-waste, permits) and consistent quality standards
- Design for logistics: concentrate nutrients; choose scale; minimise transport distance
- Build trust: labelling, certification, and farmer advisory support

2) Use the mapping to match local feedstocks to proven pathways.

3) Focus policy on removing cross-border friction and de-risking investment.

Public TechPractice dataset (Zenodo): [10.5281/zenodo.17423259](https://zenodo.org/record/17423259)

Explore entries by feedstock, technology, TRL, and product category; use it to shortlist region-appropriate BATs.



Questions?

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