Nutrient recovery in the UK: A call for cross-sectoral action

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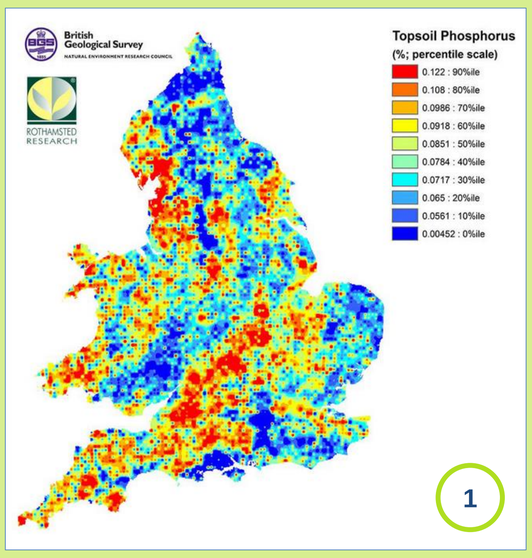

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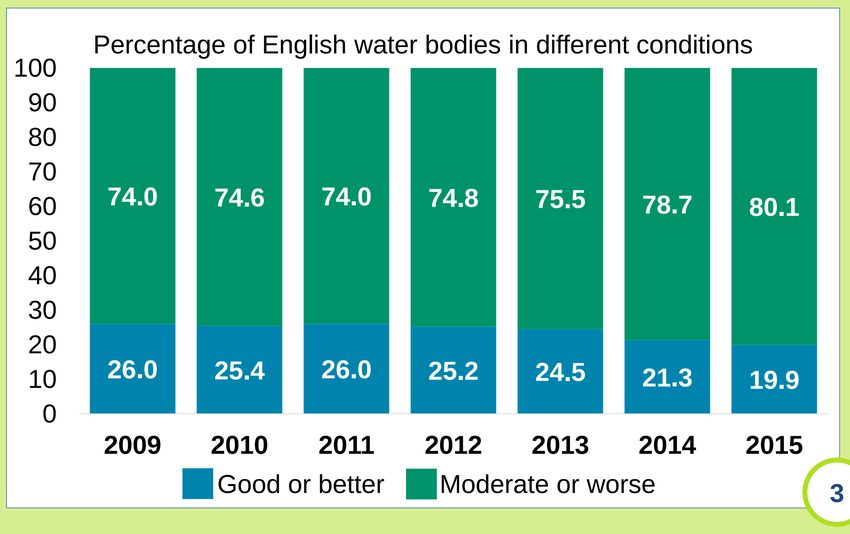
Overview

The UK is struggling to meet its water quality obligations under the Water Framework Directive and will find it increasingly difficult to change this until sustainable nutrient management becomes business as usual.

- Long term land application of treated sewage sludge (biosolids) has increased phosphorus concentrations in some soils. This forces biosolids and other organic manures (such as digestate and cattle slurry) to move further to find a market
- Intensive livestock production and an increase in anaerobic digestion put additional pressure on land bank, acting as point sources for high nutrient organic manures. Anaerobic digestion can also increase pH and ammonium content, increasing risks of ammonia volatilisation
- Most digestate in the UK is not regulated as a waste, which means that it's application to land does not need the permission of an environmental regulator. There is anecdotal evidence that excessive quantities of digestate are being applied to land that does not need it, causing direct water pollution
- Nutrient recovery technologies have not been widely adopted in the UK due to a lack of drivers and a poor fit with UK infrastructure



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Feedstock	Dry matter (%)	pH	N-total (kg/t FW)	NH_4-N (kg/t FW)	NH_4-N (% N-total)
Cattle slurry	7.22	7.4	3.5	2.0	67.0
Digestate	5.93	7.9	3.6	2.4	80.5

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Ammonia emission factors for cattle and pig slurry stores	g N $m^{-2}d^{-1}$
Cattle slurry stores and lagoons (without crust)	3.42
Cattle slurry stores and lagoons (with crust)	1.71
Pig slurry stores	3.16

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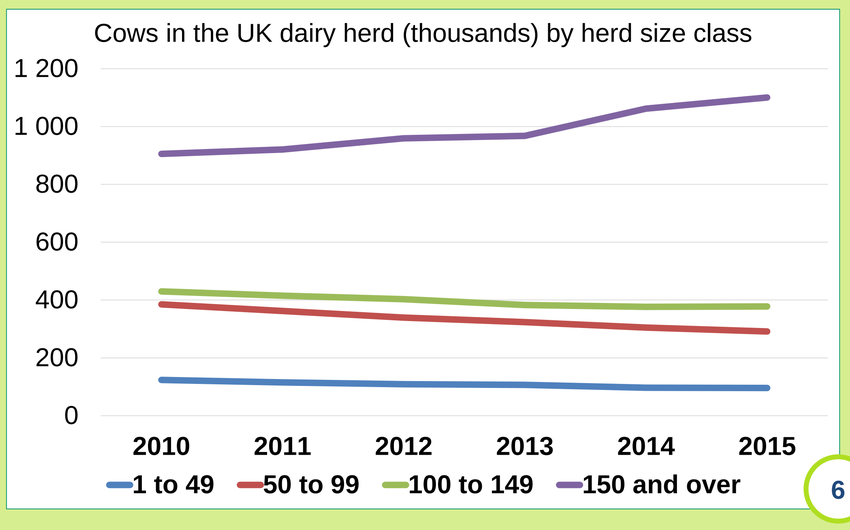

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System	Substrate	Output	P-recovery	N-recovery	Capital costs (USD)	O&M costs (USD)
Screw press separation	Digested cattle slurry	Fibrous / fine solids	15-25%	15-30%	$32 – 36 per cow	$5 – 6 per cow $year^{-1}$
Centrifuge + polymer separation	Digested cattle slurry and food waste	Fibrous / very fine solids	75 – 90%	45 – 55%	$130 – 150 per cow	$25 – 75 per cow $year^{-1}$
Struvite precipitation	Digested or raw cattle slurry	Granular fertiliser	75%	30%	$100 – 150 per cow	$90 – 110 per cow $year^{-1}$
Ammonia stripping	Digested layer manure	Ammonium sulphate solution	80 – 90%	55 – 65%	$400 – 500 per cow	$100 – 160 per cow $year^{-1}$

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Call to action

The Environment Agency has stated that it aims to achieve good status in at least 60% of water bodies by 2021. To stand any chance of delivering this, there is a pressing need to find cost-effective solutions to nutrient management in the waste water, agriculture and anaerobic digestion sectors. This action is necessary not only to help improve UK water quality, but to increase resource-efficiency by ensuring that the right quantity of the right nutrient is applied to the right crop at the right time. The following actions are suggested:

1. A collaborative industry and government-funded research competition to develop new approaches to nutrient recovery from digestates, slurries and sludges
2. A collaborative industry-funded research competition to downsize existing nutrient recovery techniques to make them better suited to UK market conditions
3. Regulation of the land application of all high nutrient organic manures, whether they are currently considered wastes or not
4. Reductions in soil thresholds for nitrogen and phosphorus from all sources

Vehicle type (load size)	£t/m^3 spread
Broadcast – whole digestate	£2.00 - £3.00
Bandspread – whole digestate	£3.00 - £4.00
Shallow injected – whole digestate	£3.50 - £4.50
Fibre digestate application	£2.00 - £4.00

Vehicle type (load size)	Cost (£/hr)	Cost for 10 mile delivery (£ per t or m^3)
Broadcast – whole digestate	£60 - £80	£3.00 - £4.00
Bandspread – whole digestate	£40 - £60	£2.00 - £3.00

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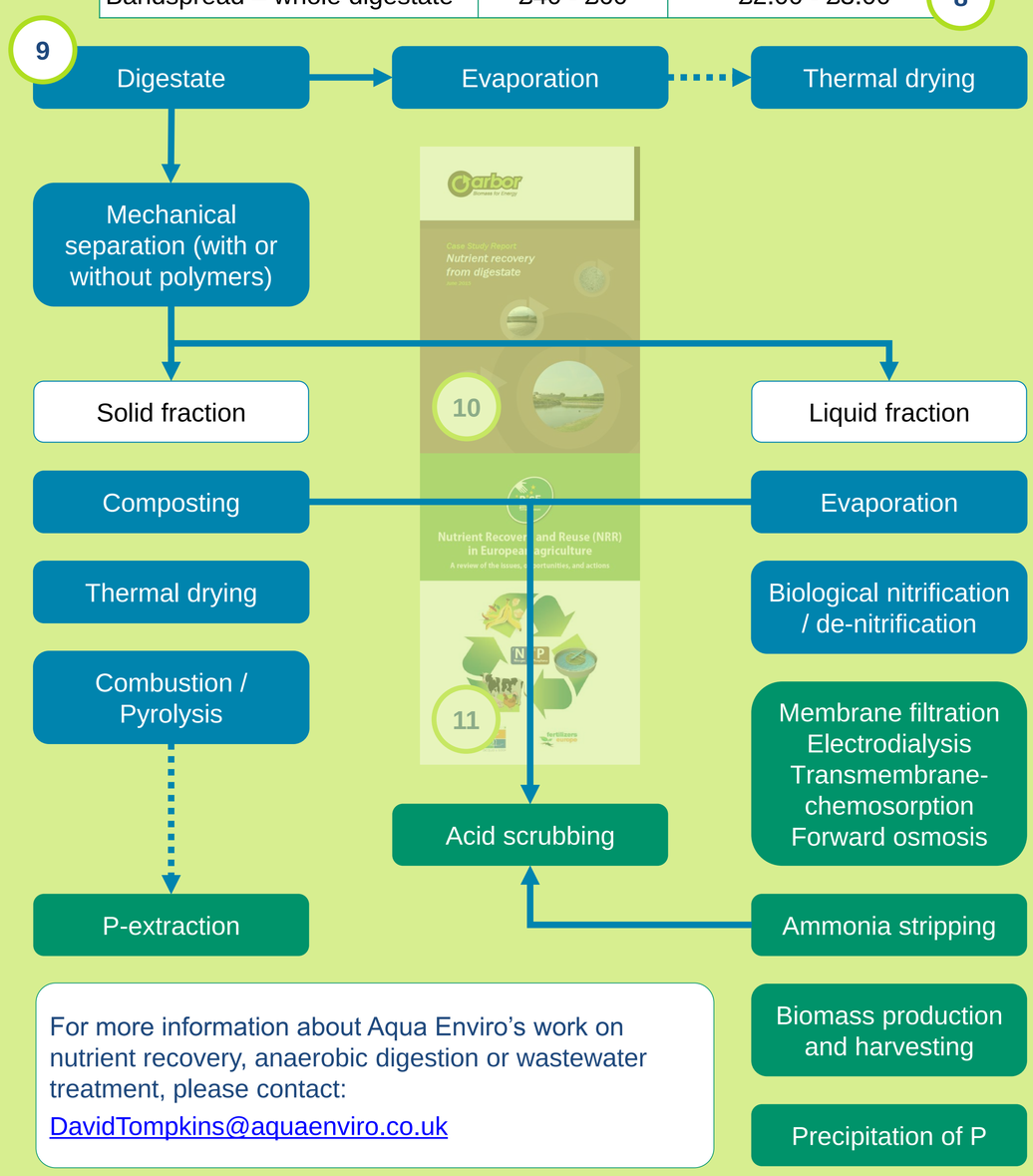

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For more information about Aqua Enviro's work on nutrient recovery, anaerobic digestion or wastewater treatment, please contact:
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Sources

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