Healthy soils
SECURE Grand Challenge, University of Glasgow

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Healthy soils

- Healthy soils are vital to a sustainable environment
- Quality depends on complex interacting factors including inorganic and organic solids, structure, and a diverse and abundant micro- and macro-fauna
- Recycled materials benefit soils, but may also introduce physical and chemical contaminants
Recovery to land

- Recovery of waste-derived materials
  - Key source of nutrients & soil improvers
  - Reduces cost to industry & land managers
  - Increases resource efficiency

- Regulatory approach
  - Relevant Objectives (WFD Art. 13)
  - We want recovery without harm

- Facts and figures
  - 10 Mt of biosolids, composts, digestates and other wastes spread each year
  - Applied to 2% of farmed area each year (150 – 250k ha)
  - We have issued 300+ permits and process 2,500 deployments per year
Protecting human health

Compost applied to agricultural soils

Milk and other produce from grazing animals may be ingested by consumers.

Livestock grazing pasture or fed forage/cereals may ingest contaminated plant matter and soil. Contaminants absorbed by animals may be transferred and accumulated in animal tissues including muscle, organs, eggs, and milk.

Compost ploughed into surface soil increases organic matter and improves structure. Contaminants present in the compost may also accumulate in the soil.

Contaminants may be taken up from soil by plants through the roots, deposited on leaves through soil splash, or simply be found in soil adhering to roots and tubers pulled from the ground.
Screening tools for health risks

Soil

Applied wastes

- Volatilisation
- Leaching
- Degradation
- Crop Offtake

- Grass
- Green veg
- Root veg
- Cereals
- Fruit

Dairy cattle

Beef cattle

Pigs

Poultry

Milk

Beef

Offal

Pork

Chicken

Eggs

D I E T
Our dilemma

… in regulation is to balance the potential aggregated risk from individual farms, while taking a reasonable and proportional site-specific response. On their own such farms contribute very little to risk at a national level. E.g., the amount of food that one medium-sized farm contributes to the diet of national consumers is infinitesimally small. However, the concern is that soils, once contaminated, remain so for decades and over time the amount and extent of contamination will spread. Therefore, the basis for risk assessment is often to consider a worst-case where all exposure comes from similarly polluted soils.
The challenge

Is there any mathematical way to demonstrate and account for the progressive and aggregated effect of individual farms at a bigger (regional or national scale) in site-specific decisions and on the available landbank? How can we better evaluate the effect of individual decisions on the management of the landbank and the creeping effects of long-term environmental deterioration over time? Can we define a tipping point? Can we predict where we are on any change – response curve?
## Available Datasets

<table>
<thead>
<tr>
<th>Category</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Soils</strong></td>
<td>Contamination – G-BASE (BGS), National Soil Inventory (Cranfield Soil and Agrifood Institute), GEMAS (BGS, European Datasets) Properties – LandIS, SOILSERIES, HORIZON (Cranfield Soil and Agrifood Institute)</td>
</tr>
<tr>
<td><strong>Land use</strong></td>
<td>Customer and Land Database (CLAD) – Rural Payments Agency British Survey of Fertiliser Practice (Reports and Datasets) – Defra Agriculture in the UK (Reports and Datasets) – Defra</td>
</tr>
<tr>
<td><strong>Spreading activity</strong></td>
<td>Biosolids – Individual water companies register under Sludge Regulations Wastes – Environment Agency holds deployment information under EPR 2010</td>
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</tbody>
</table>
Contact me for further information

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