

Soil Carbon Enhancement for Excess Nutrient Elimination

SCEENE-European Innovation Partnership

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of Agriculture, Food and the Marine



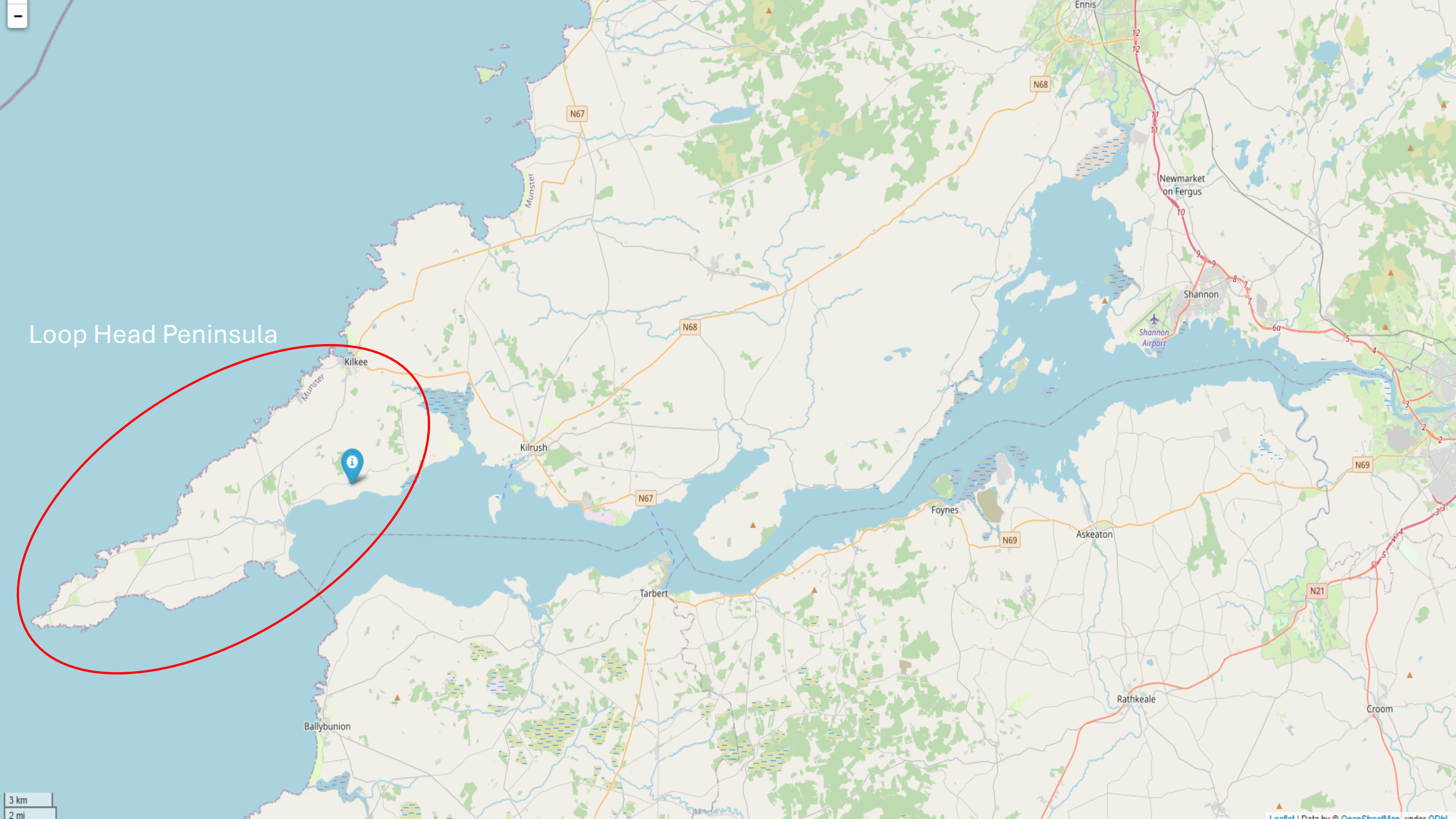
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Department of Agriculture,
Food and the Marine



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Loop Head Peninsula





Loop Head Peninsula

Agricultural Activity

- Dairy and beef farming are the predominant agricultural activities

Soil Type

- Soils are of peat and peaty gley soils
- Poorly drained, acidic
- Some shallow minerals soils on exposed ground
- High rainfall throughout the year

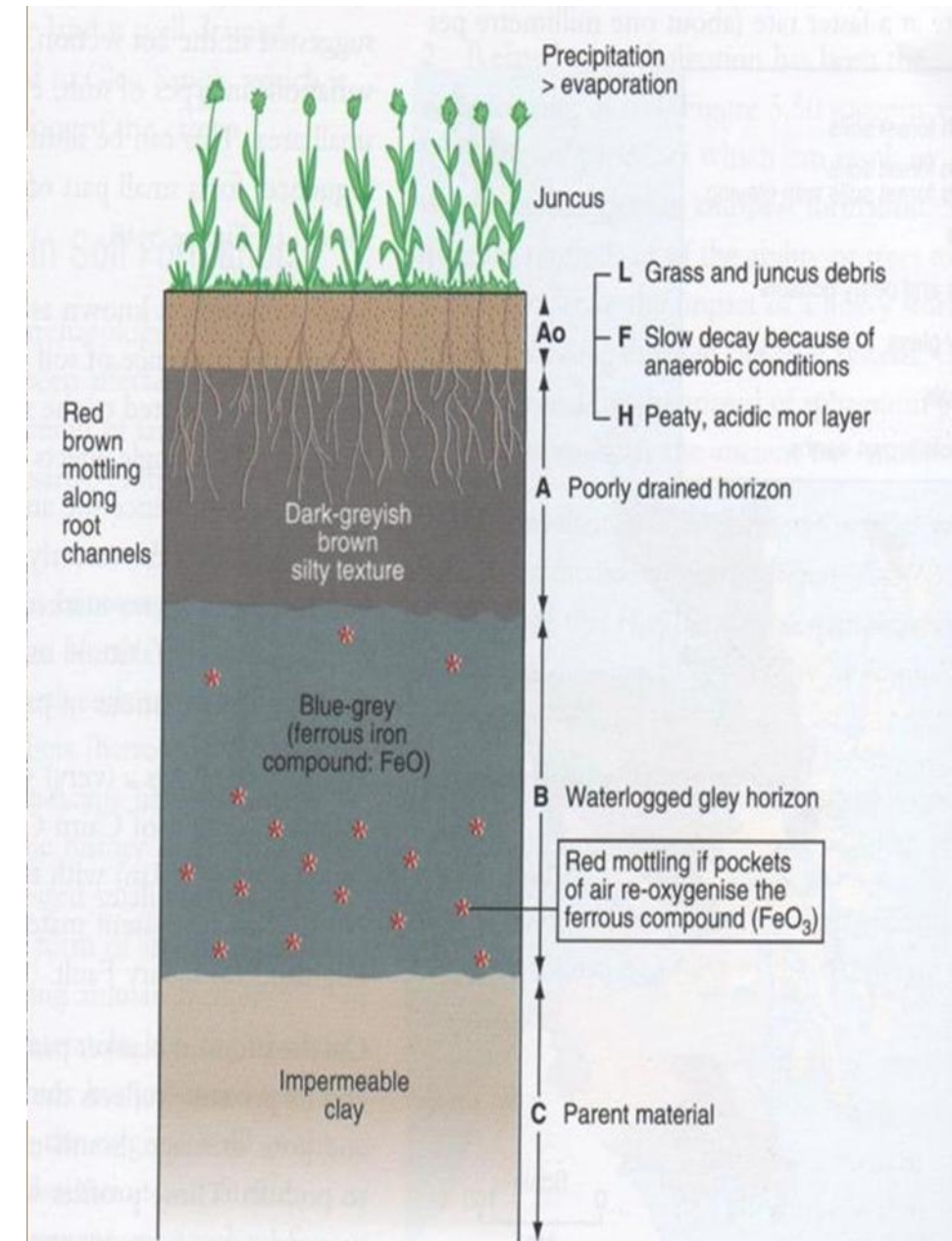
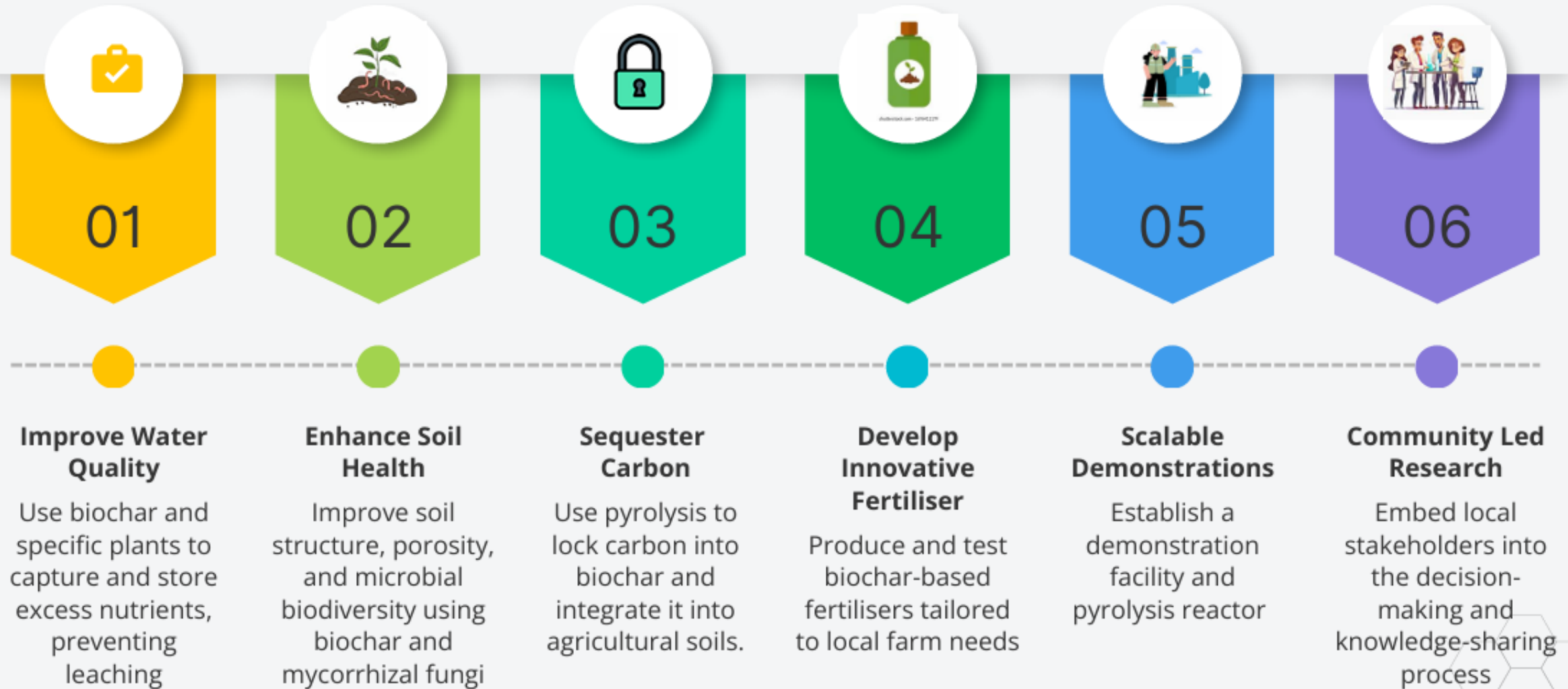


Fig 1. Typical soil type on Loop Head

PROJECT GOALS



Biochar

What is Biochar?

- Biochar is charcoal-like material produced from plant material during combustion at high temperatures in a low oxygen environment.

Why is it valuable?

- Biochar has a high 'Cation Exchange Capacity' – reduces loss
- Provide habitat and carbon sources for soil microorganisms, promoting reproduction and growth.
- Alkaline, acid-neutralizing capacity up to 33% of agricultural lime (Van Zwieten et al., *Plant and Soil*, [2010](#))
- Increase soil porosity (Quin et al., [2014](#))
- Promote germination and seedling growth



Fig 2. Woodchip before and after pyrolysis

How will biochar be made?

1. Raw slurry fed into separator
2. Separated into solid and liquid fraction
 - Solid fraction (approx. 40% DM)
 - Liquid fraction nutrient rich
3. Liquid fraction collected into tank for further processing and/or formulation

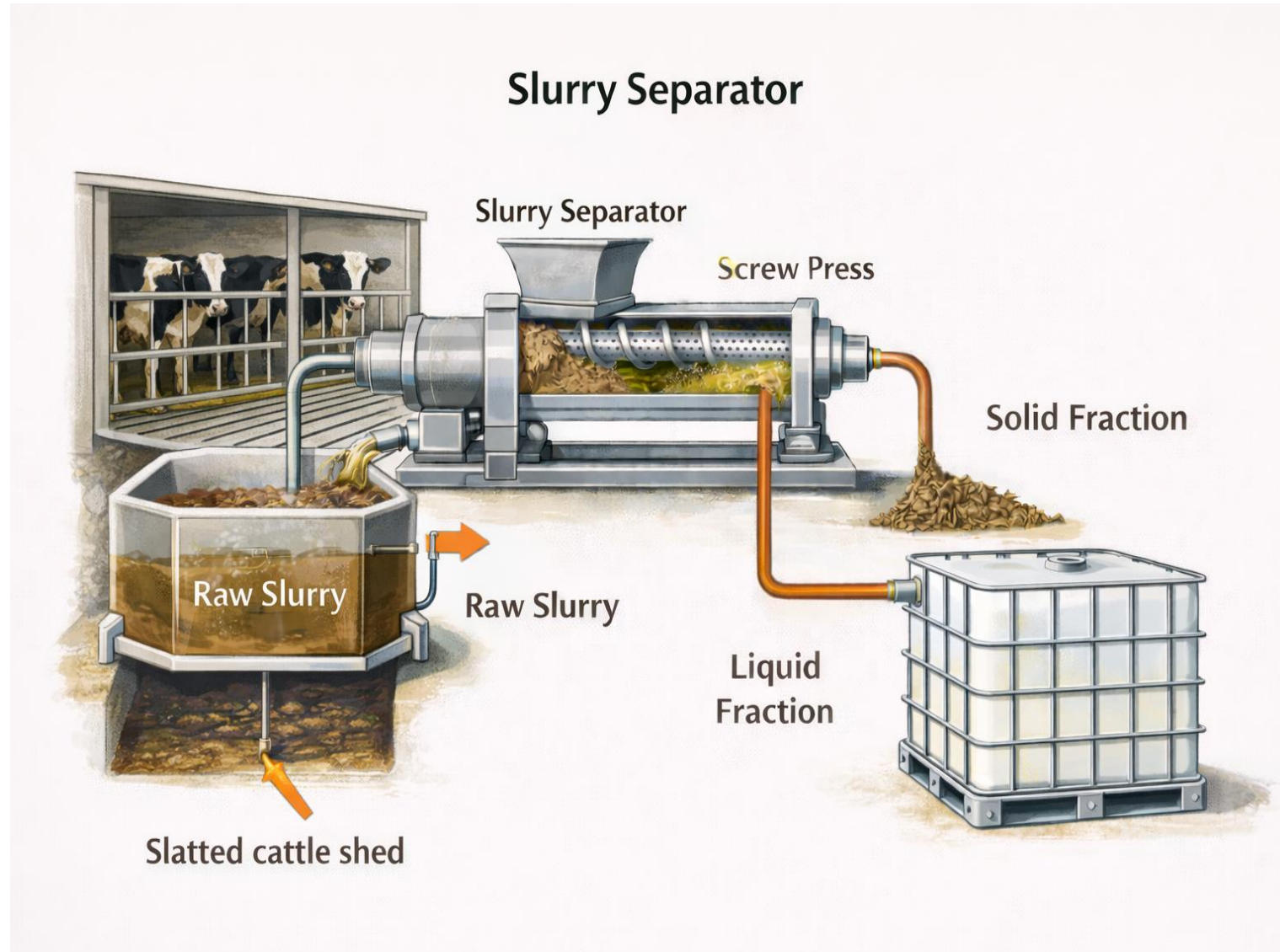


Fig 3. On farm separation of cattle slurry

Pilot Pyrolysis Plant Using Dried Slurry as Raw Material

Recirculating Syngas Back into Pyrolysis Combustion Chamber

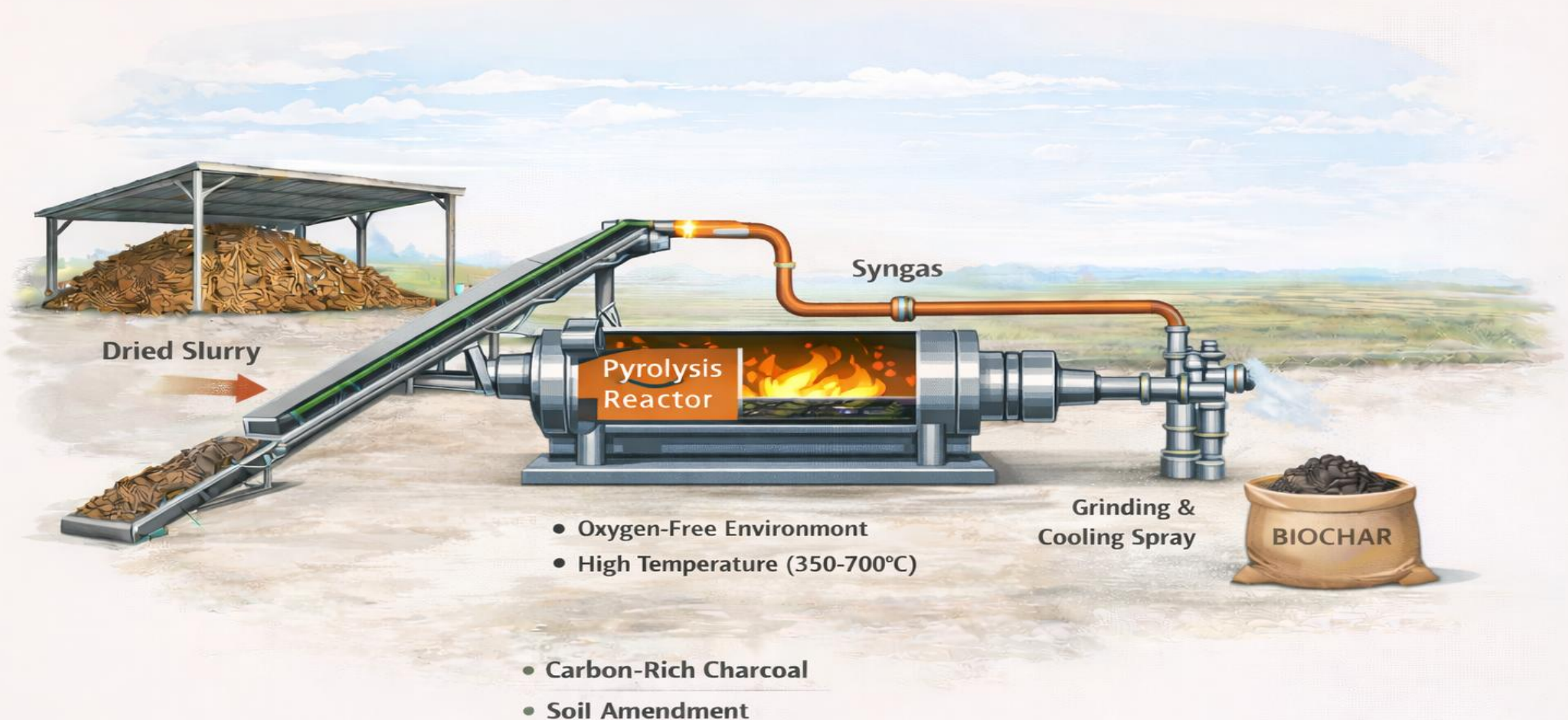


Fig 4. Production of Biochar from the solid fraction of cattle slurry

Production of Biochar-fertiliser

- a) Formulated from the liquid fraction of the animal slurry
- b) Concentrated using Biochar impregnated membrane and/or Reverse Osmosis filtration
- a) Biochar added
- b) Any additional macro and micronutrients purchased and included
- a) Conform to Regulation (EU) 2019/1009
 - The EU Fertilising Products Regulation

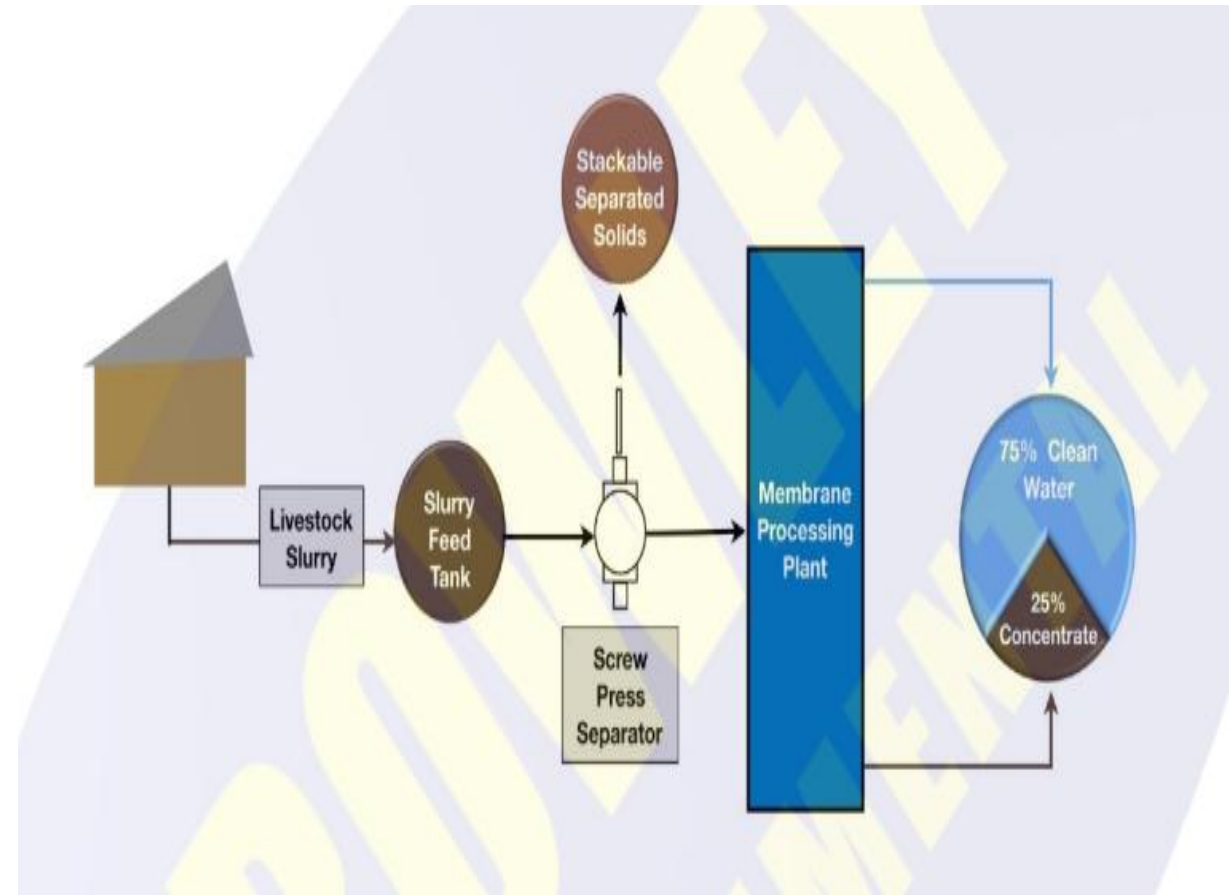


Fig 5. Reverse osmosis treatment of cattle slurry

Laboratory trials

- 1) Study biochar-based slurry as a soil structure and carbon enhancer
 - a) Soil health baseline (soil carbon, SOM, available nutrients, heavy metals & biodiversity indices)
 - b) Soils will be inoculated with new fertilisers the baseline studies repeated.
- 2) Study effects of fast-growing, carbon-capturing crops (rye grass, hemp, maize, clover)
 - a) Effect on soil carbon with/without biochar-based slurry
- 3) Study effect of mycorrhizae in combination with selected cultivars on soil carbon storage, and plant health
 - a) Controlled growth chamber trials using commercially available mycorrhizal fungi formulated into commercial pellets will be applied to seedlings.
 - b) The best outcomes for mycorrhizal fungal application will be determined by analysing plant growth, mycorrhizal parameters, plant nutrient uptake and soil phosphatase activity, roots size and morphology.

Catchments assessment and Mitigation of nutrient run offs

1) Baseline water quality

- a) Measure (x2 yearly) - N,P, Ph, EC, COD,BOD, TSS, heavy metals, anions & cations, *E.coli*, *Enterococcus*

2) *Field Trials*

- a) Farm 1 - cultivate *hemp or Maze* bordering the catchment to absorb extra nutrients
 - the land will be fertilised twice yearly using unprocessed slurry
- b) Farm 2 - cultivate *hemp or Maze*
 - the land will be fertilised twice yearly using biochar-slurry
- c) Farm 3 - will not cultivate any carbon plants and
 - only use Biochar-slurry to enhance the soil carbon.

SCEENE-EIP - Soil Carbon Enhancement for Excess Nutrients Elimination

Key selection criteria:

- | | |
|---|--|
| a) 18 years of age, or over, on the date an expression of interest is received by the SCEENE-EIP Project Team | Yes ☐ No ☐ |
| b) Must hold an active herd number | Yes ☐ No ☐ |
| c) Must be an <u>active</u> farmer, the farmer must have submitted a current application for Basic Income Support for Sustainability (BISS) which includes a declaration of all lands farmed. This is required in each year of the participant's contract | Yes ☐ No ☐ |
| d) Farming at least one parcel containing qualifying lands within, or partially within the Loop Head Peninsula | Yes ☐ No ☐ |
| e) Farm managed by the applicant for the duration of the project. | Yes ☐ No ☐ |
| f) Engaged in dairy farming, livestock, horticulture or crop production. | Yes ☐ No ☐ |
| g) Generate and store farm waste such as slurry, farmyard manure, or plant residues | Yes ☐ No ☐ |



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For Further Information please go to: www.scene-eip.com or contact Brendan or Kirsty

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