Synergies from co-digestion of grass silage with other feedstocks

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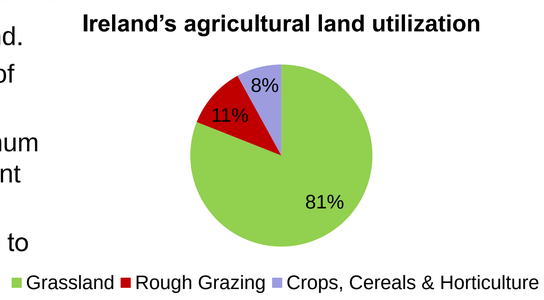
1 Introduction

- Ireland has 4.2 million hectares of agricultural land.
- 1.7 M t of dry matter (DM) is available in excess of livestock requirements (McEniry et al., 2013).
- This DM can be increased up to 12.2 M t DM/annum average by more intensive grassland management (McEniry et al., 2013).
- 10% of the Ireland's grassland area could fuel up to 55% of all passenger cars with compressed biomethane (Wall et al., 2013).

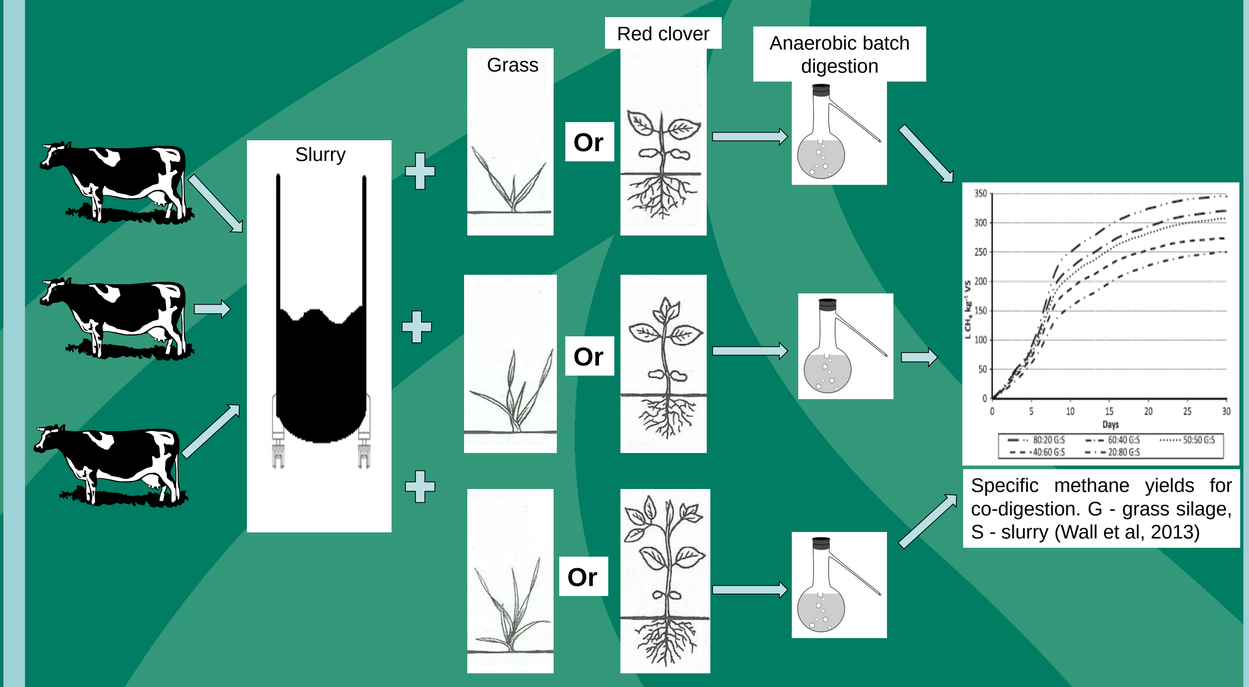


- In 2010 there were 1.07 M dairy cows in Ireland. During the 20 weeks winter storage period of slurry these cows can provide 7.07 M t DM/annum (Wall et al., 2013).
- Long term mono-digestion of grass silage can suffer due to a deficiency in essential nutrients. Addition of slurry to grass silage can provide these essential nutrients.
- Co-digestion of silage and slurry may produce synergistic effects providing higher biogas yield compared to mono-digestion of silage or slurry.

2 Objectives

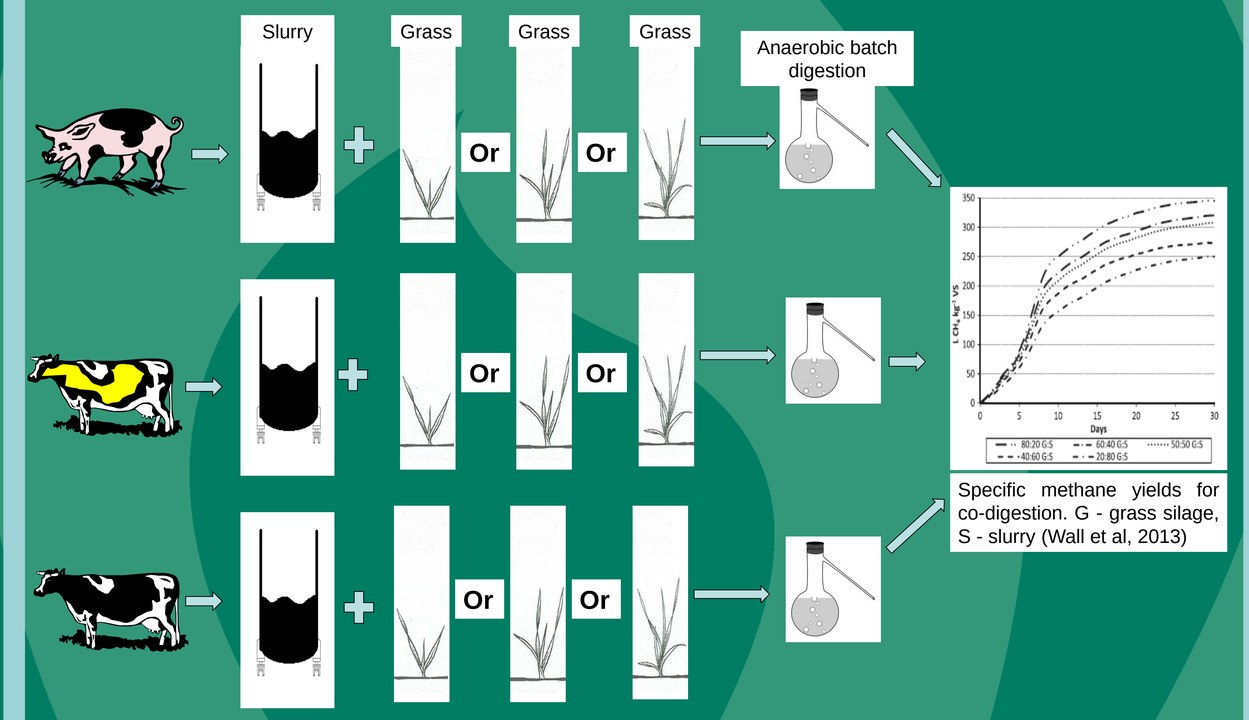
- Identify the optimal growth stages of grass and legume silages and the optimal mixture with cattle slurry for biomethane production.
- Identify the optimal slurry type and the optimal mixture with grass silages harvested at different growth stages for biomethane production.
- Undertake a full cost analysis of biogas/biomethane production system based on the silage and slurry feedstock studied above.
- Undertake a full inventory of a farm scale anaerobic digester producing biogas from grass silage and cattle slurry.

3 Co-digestion of grass and red clover silages of different growth stages with cattle slurry



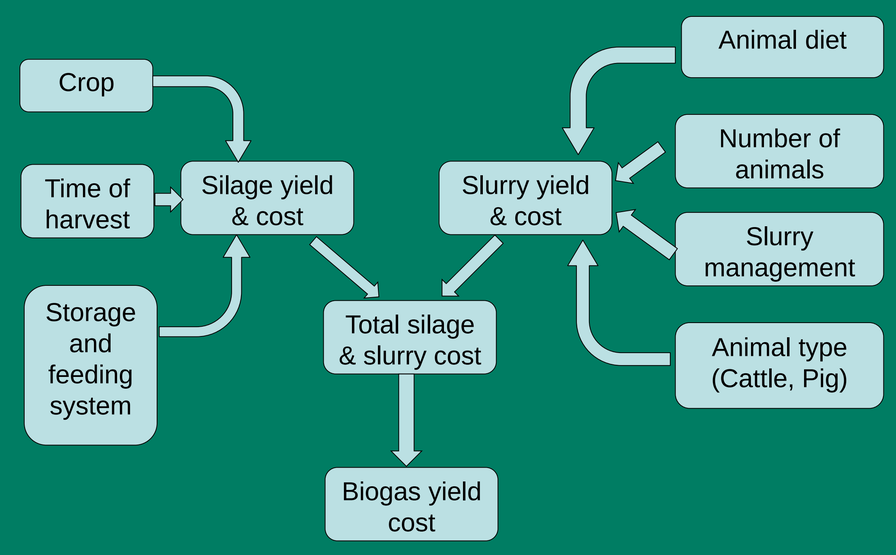
Specific methane yields for co-digestion. G - grass silage, S - slurry (Wall et al, 2013)

4 Co-digestion of different slurry types with grass silage of different growth stages

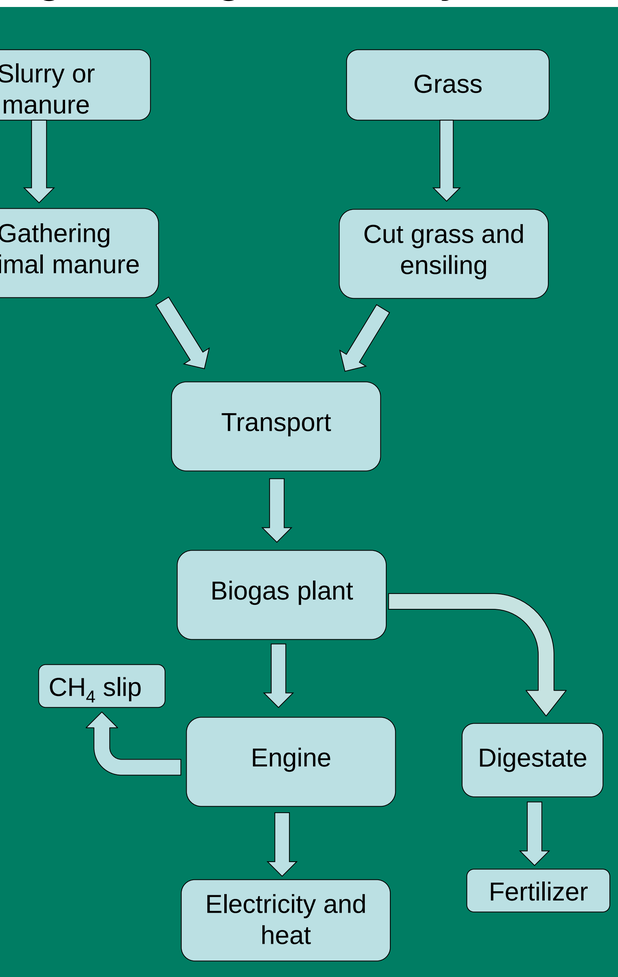


Specific methane yields for co-digestion. G - grass silage, S - slurry (Wall et al, 2013)

5 Economic modelling of biogas yield from the co-digestion of grass silage and slurry



6 LCA of anaerobic digester (to be built at Teagasc Grange) fed with grass silage and slurry mixture



7 References

➢McEniry, J.; Crosson, P.; Finnan, E.; McGee, M.; Keady, T.W.J.; O'Kiely, P. (2013) How much grassland biomass is available in Ireland in excess of livestock requirements? *Irish Journal of Agricultural and Food Research* **52**

➢Wall, D.M.; O'Kiely, P.; Murphy, J.D. (2013) The potential for biomethane from grass and slurry to satisfy renewable energy targets. *Bioresource technology* **149:** 425-431

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