Cost of Pig Manure Treatment

Tereza Nolan

Teagasc, Pig Development Department, Animal & Grassland Research & Innovation Centre, Moorepark, Fermoy, Co. Cork.

Costs for 500 sow unit

1

2

3

4

5

Costs for 500 sow unit

Assumptions:

- 500 sow integrated pig farm
- Producing 10,500 m^3 manure/year (21 m^3 /sow)
- Dry matter of manure: 4.3%
- Treatment option analysed separated BUT…..

Anaerobic Digestion

FEEDSTOCK + BACTERIA = GAS

- Daily load (fresh): 28.8 t manure + 3.9 t grass silage (25%DM)
- Total feedstock daily load: 32.7 t
- Gas production: 27.2 m^3 biogas (14.4 m^3 methane) per t of feedstock
- Methane gas = ENERGY = electricity or heat
- CHP efficiency: 30% (electricity) and 50% (heat)

Anaerobic Digestion

- Total project costs : €395,754

(CHP, digestor, pumps, biogas storage pipes, feeding system etc)

- Connection to the grid: €145,500

(2 kms, poor import infrastructure)

Total capital Investment:

€541,254

- Annual operating costs: **€125,253** (repayments, grass silage etc)
- Annual profit (electricity @ 0.15kWh, 40% heat): **€74,896**
- Annual Loss: **- €50,357 (€4.8/ m^3)**

Solid-Liquid Separation

Separating the digestate from AD into two fractions: High DM and Low DM

- Decanter centrifuge: €125,000
- Storage for liquid: €40 per m^3
- Storage for solids: €240 per m^2

Capital costs €650,031

- Annual Costs (repayments, maintenance, labour, chemicals, electricity etc)

Annual costs €130,526 (€12.4 m^3 manure)

After separation: needs to deal with solid and liquid fractions

Compost

ICW or Woodchip filters

Compost

Composting the solid fraction (28% DM) from separator + sawdust in a 2.4 to 1 ratio

- No capital cost

- Annual costs (blowers, pipes, thermometers, sawdust, labour, electricity) — €37,840

- Annual benefits (€20 per t compost) — €15,660

Total annual costs

€22,180

(€2.1/m^3)

Compost alone

Integrated Constructed Wetlands

Treating the separated liquid fraction

Water dilution: 256 m^3/day → land area required: 7 ha (17.2 acres)

- Capital cost
(land, plants, excavation work, site design, survey etc)

- Annual costs
(repayments, maintenance, labour, etc)

€390,394

€47,019
(€4.5/m^3)

ICW alone

Woodchip Biofilters

Treating the separated liquid fraction

Land area required: 0.35 ha (0.87 acres)

- Capital cost

(land, woodchip, excavation work, pumps, pipes, site design, survey etc) } €142,323

- Annual costs

(repayments, maintenance, labour) } €29,333 (€2.8/m^3) **Filter alone** + further treatment (P levels)

Spreading

per m^3 of manure transported and spread

5 km - €2.5

10 km - €3.8

15 km - €4.9

15 km - €4.9

50 km - €7.7

100 km - €11.8

Costs per m^3 of raw manure (500 sow unit, 10500 m^3, 4.3%DM)

- Anaerobic digestion: loss of ~ €50,000 (€4.8/m^3 manure)
- Separation : €12.4/m^3 manure
- Compost (indoors): €2.9/m^3 manure
- Woodchip filters : €2.8/m^3 manure

[0.35 hectares of land required]

- ICW : €4.5/m^3 manure

[7 hectares of land required + 265 m^3 water daily]

Land spreading:

15 km to customer's farm €4.9