

Case study 1

Available manures improve soil organic matter on a mixed farm

- The overall effect on farm profit (net farm income) is positive and applied to all the land that had received organic manures from the livestock part of the business.
- Annual lower net value (including slurry and FYM application costs) is £81/hectare after 10 years.
- Annual upper net value (excluding slurry and FYM application costs) is £106/hectare after 10 years.





Background

This is a mixed farm of 4,500 hectares. It comprises 1,000 ha farmed within the core business, including two separately managed dairy enterprises, and 3,500 ha in tenancy contracts to nine local farmers.

The soil is predominantly chalky boulder clay, and all the land is under-drained. The farm uses SYOL technology with subsequent soil testing to determine fertiliser application.

In the 1970s tillage went from mould-board plough to min-till but returned to ploughing from the late 1980s onwards. Dual wheels are commonly used on the farm to reduce compaction.

The arable business has recently become based on continuous wheat with rotational set-aside, as part of a strategy to simplify the business and focus on cereals and dairy to reduce capital and labour costs.

This analysis is based on comparing fields with and without the management of soils by the addition of manures from the dairy business, straw return or other imported organic matter.

Soil organic matter management

The farmer has an active policy of improving the arable soils with manures from the dairy businesses, because of the “enormous advantage on clays.”

- Liquid cow slurry 125 m³/ha
- FYM at 85 t/ha

All arable land receives either slurry or FYM on a rotation of 1 year in 5, with FYM spread on land close to the dairy unit to save transport time and cost, and slurry spread on some of the more distant land. The most distant land has received no manures.

- Until recently the farm also used sewage sludge and sheep manure. Sewage sludge was particularly useful for improving soil structure. The supply from the local water company is now restricted.
- The farmer considers ploughing-in grassland/set-aside an important tool to improve soil organic matter in soils returning to an arable crop.
- The majority of straw is baled for the dairy enterprises. Surplus straw (typically 20% of the total) is ploughed-in.

What difference has organic matter management made?

Benefits:

- Increased first wheat yields of 4.8 tonnes/ha over a 14-year period due to improved soil structure and improved organic matter management (approximately 10-15%).
- Soil workability is significantly improved. In 1986 a 310-horse power tractor pulled a 7-furrow semi-mounted plough, whereas in 2002 a 170-HP tractor on the same land could pull a 6-furrow fully mounted plough. This has reduced cultivation costs by 20%.
- Cultivations are reduced by one pass on the land getting slurry and two passes where it gets FYM.
- Reduced yield loss in drought years – about 10% less on land with organic manure inputs.
- Improved biological activity within the soil with accelerated residue breakdown.

Costs:

- Increased moisture retention can delay harvest in a wet autumn.
- Additional ploughing-in of grassland and set-aside is included as a cost.
- Loss of any sale value for straw that is ploughed-in.
- Contractor charges for applying liquid cow slurry and FYM are evaluated as a cost to the arable business.

Comment

The overall effect on farm profit (net farm income) is positive:

- Annual lower net value (including slurry and FYM application costs) is £81/ha after 10 years.
- Annual upper net value (excluding slurry and FYM application costs) is £106/ha after 10 years.

Most benefits on this land were apparent after 5 years. However, full benefits took up to 10 years to be realised. Over a 10-year period the returns to investing in soil management look very attractive. The estimated internal rate of return is at least 37% – far more than the annual return on most investments.