

Russell Toothill, South Yorkshire



Russell Toothill farms 607 hectares of land, near Doncaster in South Yorkshire. The farm currently produces a variety of crops including sugar beet, maize, winter wheat, oilseed rape, winter barley, carrots, canary seed, millet, and potatoes with stubble turnips and rye used as catch crops. The farm has around 380 sheep, which include Suffolk Cross ewes running with Texel and Beltex rams. Around 110 dairy calves are also purchased for rosé veal production.

The farm is situated on light sandy soil which has historically had issues with water and nutrient retention, and an inability to build up soil organic matter. Furthermore 100 hectares of restored gravel pit is also being farmed which presents further issues of low nutrient quality and soil fertility. The land is situated within 30 miles of the Humber estuary which results in the low lying and flat topography.

Russell Toothill believes that the key to farming his land sustainably is by running a mixed system. He also farms the land in a way that 'his grandfather would have been proud of', in particular making reference to the extensive crop rotation and the regular use of organic manuring. Currently the farm also has around 40 hectares in both Entry level and Higher level stewardship schemes.

Flexibility in managing the farming operation is a priority, with the ethos that you '*plough when necessary, use minimum tillage when necessary and make decisions over cropping and cultivations when and where the conditions see fit*'. This also means that all soil is tested for nutrient content when new land is acquired and every four years thereafter.

Historical soil issues have been due to the free draining and light nature of the soil and the resultant need to build up higher levels of organic matter. Russell Toothill uses a range of techniques to tackle these issues which also assist in providing stability within the soil structure. Key techniques used are:

- Integrating manure and using livestock within the system;
- Applying wastes and by-products on the land;
- Monitoring and sampling nutrient content of soil;
- Providing soil coverage throughout the year through minimum tillage and direct drilling into surface trash
- Growing maize for grain, which allows for 2/3 of the crop to be chopped and incorporated back into the soil. As well as increasing the soil organic matter content it provides greater soil coverage in winter following this late harvested crop when the light sandy soils are most prone to erosion.
- Retaining straw after harvest. For the last 40 years surplus cereal and oilseed rape straw has been directly chopped and incorporated back into the soil.
- Willow coppice has been grown previously within the farming system. Willow coppice is a long standing crop with plantations being in place for 10- 12 years. This means the soil benefits from root growth, reduced traffic and leaves falling and breaking down on the ground surface, which contributes to increased organic matter content in the humus layer of the soil.

Integrating Livestock into system

Alongside the extensive arable system, the farm contains both sheep and cattle enterprises which bring valued benefits to the soil. Organic manure and straw provides nutrients for the crop and soil profile. Mr Toothill explained that the livestock have been retained to benefit the arable system, and for the land he farms the benefits of a mixed farming system are

significant. A 5 year grass ley, containing high levels of legumes and herbs, is used within grassland production. Legume fix nitrogen in the soil and the diversity of root lengths within the herb rich grass leys helps develop the soil structure.

Waste for nutrients

Over many parts of the farm Mr Toothill has incorporated wastes and by-products into the land as an alternative to inorganic fertilisers to increase nutrient and organic matter content in the soil. Before any products are spread they are tested primarily for nutrient content and for any disease or pathogen risk. This leads to the efficient use of these products for soil development; it also allows for greater precision- applying them where they are most needed. Within the last 10 years, various waste products have been used on the land, these include:

- *Food Waste (sludge)*. Liquid food waste is injected into the soil using an umbilical system, this accuracy reduces nitrogen loss from the soil by volatilisation and minimises odour and other amenity issues. Adhering to best practice, liquid food waste is never used on land with under soil drainage systems.
- *Treated composted sewage sludge*. This provides nitrogen and phosphate and trace elements for the soil alongside improving organic matter levels.
- *Green waste compost* has been trialled on farm as a source of organic matter. It is surface spread before being incorporated in to the top layer of the soil.
- *Waste Lime*- Waste lime from a sugar factory is used on the farm instead of ground limestone as it provides neutralisation capacity plus additional phosphate, sulphur and magnesium.

Obtaining nutrients from various sources has contributed to the reduction of inorganic phosphate, nitrogen, potash and sulphur bought by the farm. By using efficient spreading techniques and incorporating the products effectively, the farm has seen significant improvements in soil quality and productivity. Organic matter levels have increased on the land, especially on newly acquired land which when tested during acquisition contained low nutrient and low organic matter levels.

Minimum and reduced tillage

Minimum and reduce tillage systems have been used within the farming system to help develop the soil structure. Most importantly, a flexible approach to cultivations is taken: the tillage system used varies across the land, so that the soil is farmed in accordance to the cropping, soil type and weather. Due to the large scale nature of the enterprise and the crop rotations, tillage systems change where appropriate. Reduced tillage and spring cropping has also helped in reducing blackgrass issues on the heavier clay soils on the farm. Using a variety of tillage methods is very much core to the flexible approach of the soil management.

Summary

The farm business has seen a range of benefits from the soil management techniques. These have contributed to the observed significant improvements in crop quality and yields, with wider improvements shown in the soil testing for organic matter levels, and resultantly water retention.

Russell Toothill has used a variety of techniques on the farm to improve the soil structure and increase organic matter showing that flexibility in soil management is fundamental when looking to protect and enhance soil quality.

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