



DUCHY of CORNWALL



Improving soil health and building carbon for healthy crops and carbon sequestration

Fact File: Wishay Farm, Bradninch, Devon



Date	January 2025
Location	Bradninch, Devon
Enterprise	Arable, dairy calves, ducks
Size	137 hectares
Actions Taken	Minimum cultivations, strip tilling, mob grazing, compost making & application, improving hedges, cover crops, species mixes
Impact on Business	75% reduction in diesel use, fertiliser reduction, improved resilience, better soils
Impact on Carbon Footprint	Net carbon negative

Tags: minimum cultivation, reducing fuel use, cover crops, organic, compost, soil carbon, carbon negative



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Introduction to the farm

Wishay Farm is comprised of 340 acres (of which 270 are rented from the Duchy of Cornwall), including arable, heifers and ducks. There is a mixture of organic and non-organic land. The family have been farming around there for five generations, and Paul is leading the revolution of this farm in improving soil health and reducing its carbon footprint.

Overall the farm is net carbon negative, largely due to the changes in cultivation methods and building of soil organic matter. There are more experiments being undertaken, based around improving soil health, making more compost and changing seed mixes for crops and green manures.

Actions

Cropland

In the non-organic system (around 130 acres), cultivations were plough based, but have now moved to using disc harrows, a combi drill, and glyphosate to control weeds. All this means fewer passes of machinery and cultivating much less soil - which has led to an extraordinary saving of diesel by 75% over 3 years!



As Paul comments, *"in wet weather you're not pushing the power harrow through the ground - so that really saves diesel"*.

With the help from the Duchy, Paul has bought a strip till drill that disturbs less soil and is much quicker. Aside from the benefits in soil management, and diesel reduction, it has really helped with labour. Paul has noticed that *"weather windows are getting shorter"*, so fewer and more timely operations are really helpful when trying to capitalise on optimum conditions.

Crops grown include wheat, barley and oats. Increasingly oil seed rape, beans and mixed crops like legumes, mustard, phacelia are introduced. Wheat and barley are sold off farm as animal feed, and oats and beans are sold to a local feed mill. A



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five way mix of varieties of wheat is being used, with an aim to help with resistance to diseases, reduce fungicides, and may have a positive impact on soil carbon.

In the organic system, cultivation is by shallow ploughing and drilling with a combi drill. Whilst not going as minimum tillage as the non-organic system, there is still a vast improvement on the old system in terms of diesel use and soil management. The system is being refined and Paul wants to go further by improving soil carbon and saving diesel.

Organic crops grown tend to be for premium markets. YQ population wheat is sold for milling, sold through the South West Grain Network This crop is grown with beans. Spring oats are sold for milling.



Soil fertility

Paul has made changes to the soil fertility inputs on the farm, and continues to experiment further. Around 70 to 80 tonnes of organic chicken manure is used every year, which is mixed in with cattle manure and ash. One third is applied to land before ploughing, and two thirds in the furrow before drilling.



Using a microscope, Paul is checking for the quality of compost and the micro-organisms in it. In the food waste being composted in IBCs, he's noticed nematodes, which he sees as a good sign. In some composted duck manure, using the Bokashi method, there are lots of protozoa present.

"Every farmer should have a microscope - you can't measure where you are"



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without it. Combined with the shovel, these are powerful tools."

Furthering the compost trials, Paul is also using vermicompost systems, and making compost extract to apply as a liquid fertiliser with the seed drill.

In the non-organic system, Paul is hoping to dissolve urea in an old bulk milk tank, to apply as a foliar spray. This can be 50-70% more efficient than applying as a granule to the soil, with significant cost savings and carbon reductions.

Rates of artificial fertilisers have been reduced (down by 10kg/ha/yr - last year the rate was at 160kg/ha/yr) and a dose of compost has been introduced. No potash has been applied in the last three years, responding to the needs of the plant by using leaf, rather than soil analysis. Glyphosate is being applied at one third of the normal rate.

Grassland

65 replacement heifers are raised for a neighbouring farm, feeding on pasture and a five species wholecrop as a supplement. These used to be grazing across the whole field (each 6-7 acres in size), split into two groups. Now they graze in three groups in a mob grazing/strip grazing system. The cows can graze the hedges if they need to too.



Around 100 acres of herbal leys were drilled in the autumn by over-seeding. Whilst Paul is waiting to see what happens, his hope is that it improves the sward diversity, rooting depths, and quality of diet for the cows.

Some sheep are brought in over winter to graze off cereal crops in winter.



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Wildlife

Paul has been observing dung beetles across the farm, in particular in cow pats. This links to the change in grazing management and worming in the cattle, and measuring faecal egg counts rather than just worming regularly as before. Wormers have a negative effect on dung beetles, and therefore on the soil ecosystem.



The farm has some ancient woodland and some plantation larch. In certain field corners trees support the pheasant shoot.

In the hedges there are fewer hedgerow trees; when the old ones died they weren't replaced. However natural regeneration is being allowed now - which saves time and money, and ensures the hedges benefit from local genetics. Fruit and nut trees will be introduced to attract thrushes and other birds. If this is successful it will be expanded in future years.

Hedges used to be trimmed hard every year, approx 2m high by 2m wide. Now they're being trimmed on a 2-3 year cycle, moving more towards an A shaped frame that supports more biodiversity and sequesters more carbon.

Soil

Worm numbers have increased over time, perhaps due to more diversity in the seed mixes, herbal leys and cover crops. In the arable system, there is noticeably more fungal growth between the crops rows.



Last year molasses was sprayed on at 3 litres/hectare before drilling. This helps to feed soil microbes, and delays the release of Nitrogen

"By feeding the bottom of the food chain, the worms have benefitted" observes Paul.

He's aiming to find protozoa in soil, a big target! Using liquid extract with the drill is the way forward, he thinks, applied at drilling stage.



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Ducks

Around 6,500 ducks are raised for meat, from day old to 28 days. The system is relatively input-output, and the feed for ducks equates to around 20% of emissions from the farm. A development could be to move towards a more closed-loop system for feed, e.g. home produced legumes? This however would be dependent on the customer (duck rearer) - and the final customer paying a bit more.

Other

With assistance from the Duchy, the farm now has a substantial rainwater harvesting system, reducing reliance and cost on mains water.

Impacts

Cropland

By saving fertiliser, the farm is saving substantial amounts of money and carbon. 75% reduction in diesel use (in the non-organic system) is impressive by any standards. Further improvements in crop establishment, management and harvest demonstrate just how fundamental changes in cultivations can reduce carbon emissions.

With 1,000 litres of diesel emitting nearly 3.4 tonnes of CO₂e, this is a significant area of emissions for any farm, and any savings make an impact on the overall carbon footprint - especially in arable and horticultural systems.

Soil

With a renewed focus on soil biology is paying dividends in crop health and substantial soil carbon gains across the farm.

Compost application, and further experimentation in compost systems, offer a bright future for soil fertility and health. Use of resources on, or close to, the farm demonstrate a forward thinking approach to holistic farm management.





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Grassland

"Grass growth in the new grazing system feels much better" says Paul. "The areas that are overgrazed don't come back as quick; weed suppression where mob grazing occurs is better because of the action of hooves and intense grazing over a short period."



Sheep are helping to reduce the amount of fungal diseases in subsequent cereal crops, therefore reducing the need for fungicides.

Wildlife



Improvements in dung beetle numbers, and an observable improvement in soil fungal levels and worm counts shows more biodiversity on the farm. The soil ecosystem underpins the rest of the food chain.

Changes to hedgerow management and reintroduction of hedgerow trees will offer greater habitat and food courses for a range of bird species.

Cover crops are providing valuable habitat for insects and birds.



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Carbon

The aim of the farm is to be net carbon negative, consistently. The primary drivers for this will be a continued reduction in diesel use and artificial fertilisers, and concurrently an increase in soil carbon across the farm, which sequesters carbon and offsets any emissions.

Paul is clear where his focus is - *“trees are a big white elephant - soil carbon is where it’s at! Building carbon in the soil builds resilience in the system.”*



Three questions

1. What’s the most difficult thing about making changes?

“Making a start - I started with cover crops. You need to justify buying machinery, but also worrying what others are thinking - your neighbours are looking over the hedge!

You have to be thick skinned to take any criticism; you can explain away any failures, but ultimately results can speak for themselves. Neighbours might take the mick, but good practice will spread!”

2. What setbacks have you had, and how have you dealt with them?

“We grew ancient grains (YQ Wheat) and added Einkorn - which is tall and deep. Five acres were drilled but it hasn’t germinated well. You keep trying!

On cover crops, you can spend loads on seed, but not necessarily see the benefits straight away. You need to persevere, as with any aspect of farming. Keep adding species in to the mix, and observe what grows well - it’s a chance to learn.”



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3. What are the best things in the changes you've made?

"Molasses seemed to have helped significantly increase the worm population on the farm. The strip till drill is great - you drive over this field once and close the gate!"

Using the microscope is very interesting, especially things like comparing the soil in field to the hedge. I've been adding some woodland soil in to the compost to add diversity. It's fascinating to look at under the microscope.

There's lots to learn."

Links

Instagram: The Experimental Farmer

https://www.instagram.com/the_experimentialfarmer/