

# Improving soil structure and fertility with the help of S4P

 **farmer profile**

*The SWARM Hub accompanied Soils for Profit (S4P) on a follow-up visit to a farmer who participated in the SWARM project and found out how he has benefitted from the support provided. Three years on from an initial S4P visit, Mark Williams from Presingoll farm at St Agnes, Cornwall, describes how they have been improving soil fertility and structure on the farm through focussing on removing compaction to increase soil aeration.*



Mark explains that the mixed farm, which he runs with his brother Andrew, includes vegetable and arable production as well as a pedigree South Devon suckler herd.

With the exception of one block of off-land, the farm does not currently fall into a [Nitrate Vulnerable Zone](#) (NVZ). The majority of the holding is relatively flat and away from watercourses. The main soil type on the farm is described as a Denbigh 2 type, medium loam over shale, which drains well when the soil structure is not damaged. Characteristic of soils on the edge of granite bedrock in Cornwall, the soil on this farm is

also gritty, containing lots of small granite stones and can be shallow in places.

The farm was organic from 2001 for 6 years with cattle, pigs and organic cauliflowers however Mark and Andrew found that the market could not cover the costs of the pig food: *“The costs of doing it outweighed the benefits so, although we have retained many organic principles, unfortunately we had to stop being organic last year”* says Mark, *“the cost of food escalated from £280 to £580 a tonne but the price of pig products didn’t go up at all.”*

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The 75 ha (215 ac) farm now consists of 29 ha (73 ac) in a combination of permanent grassland and rotational leys (with 50 cattle), 17 ha (43 ac) in winter cereals (although this year they planted spring barley as the wheat failed), 13 ha (33 ac) in brassicas and 10 ha (27 ac) each in potatoes and bulbs (daffodils). The cattle are sold as stores (15 months).



As part of an initial S4P visit, three profile pits were dug to assess the soil. These displayed a compacted [structure](#), which was mainly attributed to long-term poaching by cattle. One field exhibited a pan caused by mechanical operations. It was suggested that the use of a flat-lift could help to alleviate the compaction issues.

S4P point out that maintaining well aerated soil produces benefits for both the environment and productivity:

- Surface drainage improved - rainwater absorbed more quickly with [run-off](#) risk reduced
- Less poaching by livestock - increased grazing window
- Increased root development - holds the soil together and increases nutrient utilisation
- Grass leys last longer
- Aerated soils recover quicker after mowing

- Better nutrient cycling leading to increased productivity
- Increased microbial action for better utilisation of fertiliser and better action of N fixing by clover

Mark says that *"We had thought that we needed to do aeration - but wanted to prove it and find out if there were any other ways of doing it. S4P recommended using a grassland aerator which we agreed would be a good move but we couldn't afford it at the time."*

Mark recognises the value of the FYM produced on the farm in terms of organic matter and nutrients and had been using it largely on areas for reseeding. The aim had been to establish the grass/clover ley early in order to get a 'good' clover stand going into the winter. As an N fixer, clover is great for the purpose of [fertility building](#); S4P highlighted that a 10-29% ground cover of clover in the sward can provide 80kg/N/hectare/year and 3-16% dry matter in the first two years.

As winter wheat had been grown for on-farm use as stock feed, it had been recommended that fertility building was reviewed so that FYM could be utilised to replace organic matter and nutrients on the arable land. It was suggested that monitoring the age of the sward and clover percentage ground cover would therefore be beneficial.

In the follow-up S4P visit with Charlotte Evans (pictured with Mark below), Mark explains that as a result of the previous S4P visit, they have taken action to remedy soil compaction by sub-soiling and ploughing and reseeding the older leys which had been poached.



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Mark says *"I put red clover in the fields to replace the leys that had become less productive due to soil damage. We also carried out some flat-lifting and more digging of profile pits. All the arable land has been sub soiled..."*

The fields they ploughed were temporary leys available in the rotation, on relatively flat land; ploughing would not be recommended on areas of species rich grassland or in high risk locations.

Following these steps Mark explains that the leys are more productive and produce better quality grazing and silage. He goes on to say *"We did try a flat-lift aerator on one field but didn't do the whole field as it was wrecking the surface. In one field where the soil was very blocky, we ploughed and reseeded it, removing compaction. He continues "We have noticed particularly that in a field where we have grown courgettes and pumpkins, the fertility has gone right up through improving the soil and having used a flat-lift."*

Mark takes us to the same field (see above right), in which a soil profile had been dug on the initial visit.



The soil profile shows a large blocky and dense structure (see below) at about 5cm to 15cm down; roots are visible but are fine and dispersed compared to the extensive network of roots that grass produces in well aerated soil.



This field is used for the cattle to come in and out as they want to so using a grassland aerator to improve structure and [drainage](#) whilst preserving the sward would be the most suitable option. The field is a good choice for out wintering as it is flat and soil type drains well. Mark goes on the say that they intend to aerate this field as a next step.

In a different field of permanent grassland Charlotte explains that the horizontal layers seen close to the surface (see below) are typical of compaction due to poaching, rather than deeper compaction caused by trafficking and field operations.

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Free-living earthworms are clearly visible in the top of the soil. These earthworms break down the litter; larger burrow dwellers found deeper in the soil provide permanent channels for drainage and aeration. The casts that earthworms excrete are important in terms of building a fine crumb structure in soils and also have a neutralising influence on pH.

Mark carries out soil testing to assess [pH](#) and nutrient content in fields that are going into a new crop. Charlotte recommends that they also test to assess soil organic matter (SOM) levels, highlighting the importance of SOM in terms of nutrient cycling and structure building, particularly in arable or horticultural fields where SOM can decline quickly where off-take isn't replaced.

Mark explains how he keeps his own field and [nutrient plan](#) and records on a spread sheet, basing his nutrient plans for the arable fields on the soil test results and crop recommendations from Defra's fertiliser manual, RB209. He hasn't spread any inorganic fertiliser to grassland because productivity has been good without additional inputs. This also means he can limit expenditure on bought-in feed.

Mark points out that the crops largely look after themselves when basics like good soil structure are in place, the animals are looking nice and he is pleased with the lack of fertiliser they use... He sums it all up saying

*"Through improving our soil management we've been able to improve fertility whilst reducing fertiliser use."*

S4P also highlight that beyond the farm scale, benefits of good soil management include reduced run-off into water courses or public roads and increased carbon storage, helping to mitigate climate change.

In addition to the [SWARM Hub](#), more information can be found at:

**Natural England:**

[www.naturalengland.org.uk](http://www.naturalengland.org.uk)

**Code of Good Agricultural Practice for Protecting Water, Soil and Air:**

available through the Defra website:

[www.defra.gov.uk](http://www.defra.gov.uk)

**Tried and Tested nutrient**

**management website:** Nutrient advice website created by the industry for the industry.

<http://www.nutrientmanagement.org>