

Retaining the soil nitrogen benefits of outdoor pigs



Why are we interested?

Whilst a key land use in our region, outdoor pigs can significantly affect environmental water quality via:

- ☐ Microbial contamination of groundwater
- ☐ Sediment and nutrient pollution of rivers
- ☐ Nitrate (N) leaching into groundwater due to nutrient deposition onto bare ground

However, work is ongoing by producers and partners to develop viable management improvements to tackle these issues.

This information sheet presents results from on-farm sampling aimed at providing some up-to-date information about soil N in pig units. This should help producers and landlords integrate their pig units better into the arable rotation, which would help reduce the environmental issues.

Questions we asked were:

1. Is there a build-up of crop available N in soils under pigs?
2. Is any enrichment maintained for a future crop?
3. How is this affected by green cover?
4. Is there any build-up in soil organic N?

What did we do?

- ☐ We sampled soil on several outdoor pigs units over four years (2017 to 2020)
- ☐ This was a partnership between the 4 farmers involved, Anglian Water, Norfolk Rivers Trust, AHDB Pork and others, to track soil changes over winter

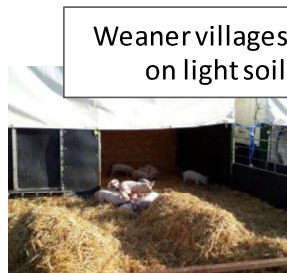
Sites sampled



A sow unit on light soil, trying natural regeneration on split paddocks



A sow unit on medium soil on grass-clover paddocks

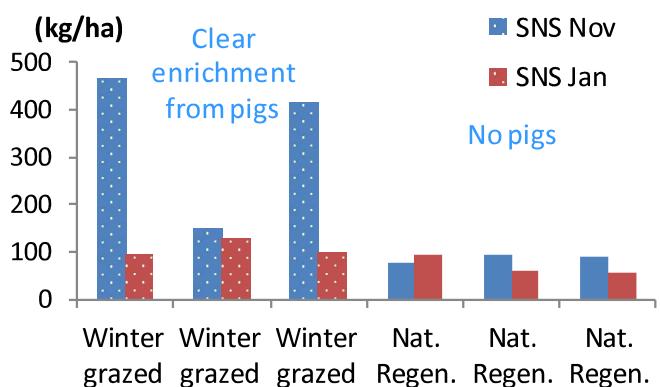


Weaner villages on light soil

Findings from bare ground units

Split paddocks: enrichment then loss

Looking at the split paddock unit, in the first year, soil mineral N was significantly enriched by the autumn (blue bars), and equally clearly lost over winter even while the pigs were still grazing (red bars). Natural regeneration didn't provide enough cover in this system to prevent losses.



Weaner villages: enrichment then loss

A similar enrichment and then reduction in soil N was seen after weaner villages, particularly where the tents had been (as opposed to the runs), though this may have been an artefact of the way the manure was scraped up.

Lower losses in a drier winter

The second winter of measurements (2018/2019) was much drier, and although there were some losses in the split paddocks being rested (having been grazed over the summer), soil N this year *built up* where they were still grazing over winter. In both years pigs were on the winter paddocks for 2-3 months before the baseline sampling in November.

Similarly, in this second winter, losses after weaner villages were less marked, although the autumn enrichment was also less, probably because the unit had moved to a new site after 10 years rotating round the previous one.



Findings from bare ground units – cont'd

Spring SNS values often significant still

Despite soil N losses over the wet winter of 56% in the split paddocks, and 38% after weaners, spring SNS values were still 0-4 on the split paddocks and over 4 after weaners.

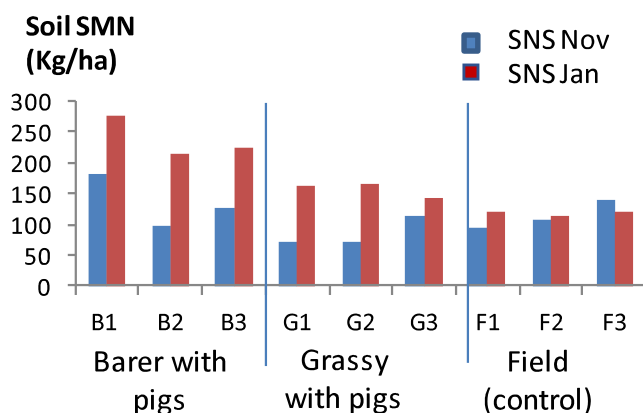
After the drier winter, N indices of 5 or 6 were common on the split paddocks, though they still fell from 5 to 1 or 2 after the weaners.

Findings in grass/clover pig cover

Soil N maintained over winter

On a third unit, on a grass ley with red clover, there was no overall loss of N from the soil in the *wetter* winter of 2017/2018. There was some movement down the soil, but the N was not completely lost from the profile, as happened with the barer units.

In the *drier* winter 2018/2019, N consistently built up over winter as shown in the chart below (as shown, we additionally compared grassier with barer radials). Movement of N down the profile was less marked than under bare units.



Retaining SNS index to the end of the cycle

The spring SMN values in the chart above corresponded to SNS indices of 4 to 6. We then took a final set of measurements in spring 2020 on this grassed unit. The pigs had been moved off over the winter and the grass cover had largely gone. After a *wetter* than average autumn and early winter, January SMN was at index 1 to 3, suggesting that cover needs to be retained right to the end if N benefits are to be fully realised.

Findings – Additionally available (organic) N is usually between 20 and 40 kg/ha after pigs

Additionally available N (AAN) was usually between 20 and 40 kg/ha after pigs, but there was no clear relationship with ground cover.

RB209 recommends that on most mineral soils (i.e. less than 4% OM), AAN will be small, unless large amounts of organic matter has been added in recent years. Our results show that soils after outdoor pigs should fall into this category

Take home messages

- ❑ Outdoor pigs have the clear *potential* to provide a nitrogen benefit to following crops, with spring SNS indices of 4 to 6 not uncommon
- ❑ Our results suggest that plant cover helps to retain this N in the soil, but that without good green cover, losses over winter can be large
- ❑ Spring SNS indices after pigs can still however be high, even after a wet winter and poor ground cover – do SMN soil testing to measure what is left
- ❑ Retaining and using this nitrogen would provide multiple farming benefits (e.g. economic, carbon footprint) and improve ground water quality
- ❑ Sampling or allowing for 'Additionally Available Nitrogen' would also be worthwhile after pigs

Further information:

More information about Anglian Water's work in catchment to improve the quality of our drinking water can be found at

<http://www.anglianwater.co.uk/environment/our-commitment/our-plans/catchment-management.aspx>

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Come rain or shine
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AnglianWater.co.uk/farming

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