Soil health findings on outdoor pig units

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 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 uncovering potential soil health benefits from pigs. These would encourage better integration of outdoor pigs into arable rotations, which would help reduce the environmental issues.

Questions we asked were:

1. Are there any nutrient changes in the soil other than nitrogen?
2. Are there any other soil health benefits?

What did we do?

- ❑ We took soil measurements from two outdoor pigs units in East Anglia between autumn 2018 and spring 2021
- ❑ We recorded VESS soil structure scores and worm counts, and sent off soil samples for Solvita soil health analysis
- ❑ This was a partnership between the two farmers, Anglian Water, Norfolk Rivers Trust, AHDB Pork and others

Study sites


Weaner villages on a light soil


Ringed sow unit on medium soil on grass-clover

Findings

Nutrient enrichment of pig paddocks

A separate information sheet illustrates the potential nitrogen benefits to be gained when integration of outdoor pigs into the arable rotation is well planned.

We also recorded benefits in other soil nutrients (see table below), though this varied with the type of pig unit present.

This partly reflects the removal of manure and straw from weaner land once the tent villages have been moved, compared to leaving manure in situ on a sow unit.

Increase seen?	After weaner villages	Partly grassed service radials
Phosphorus	×	✓
Zinc	Sometimes	✓
Sodium	✓	✓
Sulphur	Sometimes	Suggestion
Magnesium	✓	Inconclusive
Potassium	✓	Inconclusive
Organic matter	× (but slight increase in C:N in one year)	×

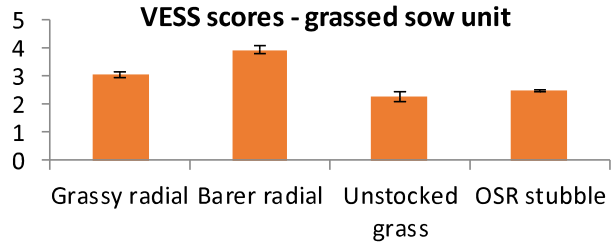
In January 2020 In the radials, the clearest benefits were seen for phosphorus, zinc and sodium. The pigs there (whether on grass or not) contributed 20 ppm phosphorus (~40kg/ha), around 10 ppm zinc (~10 kg/ha), and 5 ppm sodium (~3 kg/ha). There is a strong suggestion of an increase in sulphur too, of about 1.5 ppm (~3 kg/ha).

Soil magnesium and potassium were both highest in the grassier radials, but more data is needed to confirm this pattern. For potassium the values were not significantly higher than for the ungrazed grass.

Findings cont'd

Soil structure

On the grassed **sow unit**, soil structure in Oct 2019 in the radials was significantly worse than in un-grazed grass or the adjacent arable area (see chart below - high scores = poorer structure). However, where grass cover was good, structure was clearly less affected.



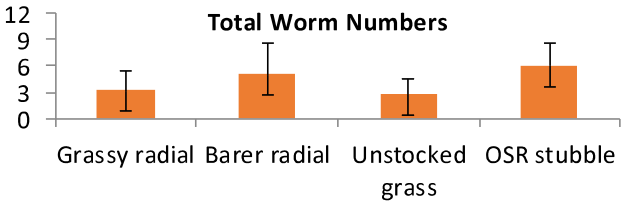
Soil structure in 2020 after the **weaner village** was visibly worse than that just outside it. This was reflected in significantly worse VESS scores, though neither was significantly different from the baseline.

However, where a cover crop or bird seed was sown after weaners, the soil structure appeared to have improved since the pigs had left (see table below).

Months after pigs	0	2 (cover crop)	5 (bird seed)	*Track*
VESS Oct 2018	3.8	3.2	2.8	*4.7*

Worms

There was no significant pattern in worm numbers on the grassed sow unit (see below) in Oct 2019.



In 2019/2020 a few worms were present previously and were still there after weaner tents. However, where the runs and tracks had been no worms were found. Was this due to spring drought affecting counts?

In Oct 2018, worms were absent straight after weaners, but present five months later. Higher numbers still were found in the access tracks.

Months after pigs	0	2 (cover crop)	5 (bird seed)	*Track*
Worms	0	0	1-2	*4*

Findings cont'd

Microbial life

Microbial biomass and soil respiration tended to follow each other. No clear effect was seen from the weaner village, with increases of 29% as well as decreases of 15% observed. Five months afterwards, there was no difference in soil respiration between ex village areas and other areas of the field.

On the sow unit, there was a suggestion that the grassier radials had higher values for microbial biomass and soil respiration compared to just grass, or arable, or barer radials, but this would need confirming with more extensive data.

Take home messages

- ❑ **Additional nutrient benefits** were clearly seen after sows, particularly in phosphorus, zinc and sodium, and possibly sulphur. Increases in sodium, magnesium and potassium were seen after weaners, and sometimes sulphur
- ❑ **Grass cover in the radials protected them** from some of the soil compaction recorded elsewhere

- ❑ **A green crop sown after pigs** may be effective at removing the compaction observed in both the sow and weaner units studied here
- ❑ No clear conclusions were drawn from the worm counts in this study on light soils. A local decline was recorded after weaner runs but as this also happened in the track it might have related to seasonal factors that year. There were indications of better (recovered?) worm numbers a few months after weaners. Worm numbers were not obviously affected by the sow unit
- ❑ There was a suggestion that microbial populations were enhanced under the grassed sow unit, but this needs confirming with more extensive data. No clear pattern was seen as a result of the weaner villages.

Further information:

For more information about Anglian Water's catchment work to improve the quality of our drinking water sources: http://www.anglianwater.co.uk/environment/our-commitment/our-plans/catchment-management.aspx
Twitter: @AWCoastCountry

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