Rooted and robust

Grass mixtures that optimise ground cover,
protect soil and benefit outdoor pig production.

Keeping it green

Achieving and maintaining decent ground cover on outdoor pig sites is difficult, but it can be done if producers choose to use more resilient grass mixtures and manage their paddocks in ways that allow areas of land a rest period while still in production.

Protecting ground water and preventing soil erosion are principal motivators for nurturing green cover on outdoor pig sites, and businesses that have implemented a grassland management plan for pigs in rotation do find that ‘growing green under trotters’ can also improve pig welfare and subsequent crop performance.

Drilling stubbles immediately after harvest, then allowing a good establishment period (at least 3 months) before the pigs move in offers measurable benefits. It creates a more resilient sward, with a root structure that is more capable of maintaining and improving soil structure, holding nutrients and reducing erosion than stubble/bare ground.

In East Anglia, a number of pig businesses are now committed to longer-term rotational contracts enabling them to seed and grow grass on the acreage designated for pigs for at least 3-4 months before the herd moves in. Others are working with their landowners so pigs can move onto stewardship cover as this land comes back into food production.

Practical trials, proven results

In 2020 North Norfolk producer LSB Pigs embarked on a two-and-half-year grassland trial to compare the performance and environmental value of paddocks sown with a pig specific grass seed mix with those sown with a traditional legume/ryegrass mix. Supported by the Norfolk Rivers Trust, Anglia Water, AHDB and a commercial seed supplier, the project uncovered numerous benefits.

The 1500-sow weaner production business managed its pigs across free-draining land sown with two seed mixtures:

- One, a specific pig-resilient blend containing a high percentage of creeping red fescue, an intermediate perennial ryegrass and late perennial ryegrass species sown at a rate of 35kg per ha.
- The other a 2-year fallow-type mix, originally designed for Ecological Focus Areas (EFA), sown at 20kg per Ha. It included Italian ryegrass, vetch, Birds Foot trefoil and Red Clover.

As expected, the paddocks sown with the pig-specific mix provided better cover. Agronomists supervising the trial noted how swards with the higher content of creeping red fescue (CRF) retained green cover for longer and appeared to develop a more resilient root network - characteristics that would promote soil structure and hopefully improve nutrient and the land's water holding capacity. These paddocks also recovered more swiftly than the legume/fallow paddocks once the pigs moved off and exhibited fewer signs of erosion.

"The project demonstrated how protecting green cover benefits soil health and helps to control erosion and nutrient leaching. It showed us we can sustain grass growth on a commercial pig operation if we use specific seed mixes and certain management techniques, and many other benefits too, linked to pig welfare, productivity and our working routines - advantages that have proved a real bonus to overall herd management," - Rob McGregor, herd manager.

Trial results suggest that a higher inclusion of creeping red fescue in both the AB15 two-year stewardship mix and/or longer term GS4-type legume and herb-rich mixes would improve the resilience of a sward that was ear-marked for subsequent pig production.

Using such a mix could help outdoor pig sites reduce erosion, improve the ground's water and nutrient holding capacity and curtail excessive run-off during periods of high rainfall - qualities that will benefit soil structures, fertility and subsequent crop production.

Creeping swards with protective benefits

The continual monitoring of soils across LSB's Coxford unit during this trial also demonstrated how the fibrous root system of the pig-specific CRF leys helped to bind soil particles together and improve structure. As a result, this sward was better able to withstand extreme weather.

Even when the surface is bare, the robust root network remains active, ready to grow new grass once the ground is given an opportunity to recover.

Observations during the three-year trial period found that less than 10% cover was lost in flipped grazed paddocks that were sown with the creeping red fescue pig mix. The ground retained grass cover more readily and a very healthy soil structure could be seen underneath.

Also, once the period of pig production was complete, these swards were in better condition, were green with fewer weeds which is a huge advantage for subsequent arable production.

Stocking rate and rest periods

This trial, and the subsequent performance of CRF swards on this commercial outdoor pig site, clearly demonstrates this resilient grass species has a vital role in pig-specific grass mixtures. However, stocking rate is also a key consideration in maintaining green cover. Previous experience at LSB has demonstrated that maintaining 10-11 sows per acre helps optimise grass growth and recovery on free draining soils. Using a 'flip-grazing' system for dry sow paddocks, also allows part of the sward time to recover while still in pig production.

Rob developed a three-paddock rotation some years ago, and the trial confirmed how this novel approach helps to maintain optimal ground conditions and prevent areas becoming bare and over-used.

Each batch of sows are penned in large paddocks, separated into three equal-sized sections. The huts and water drinkers are located in the central area, and two additional pens are fenced off on either side. The sows are initially given the middle section and one side paddock (1), and once this area is grazed off, the side paddock is closed off and the other fresh paddock(2) on the other side is opened.

"Our sows generally live in two out of three paddocks. The central paddock is in continual use and we just flip the additional grazing area from one side to the other as the grass gets grazed. This means we can give the sward time to recover, and it comes back quite quickly once the sows move off. Your best guide is the grass growth, and the sows just follow it as it grows," he explains.

Having 'fodder-under-foot' has also changed sow behaviour. Although sows are fed a specifically formulated ration once a day, the grass provides constant gut fill and the motivation to graze keeps the herd occupied.

He says sows are more active too, which has improved their fitness throughout pregnancy – a factor which is helping reduce the time it takes to farrow a litter and speed up post-partum recovery.

"Our sows enjoy grazing, they're content and there's far less stress in our herd now they're on grass."

Robust plans, resilient cover

Flip grazing has also altered dunging patterns. Manure deposits are now widespread, and that's helping distribute nutrients more evenly across the entire acreage.

The original trial paddocks, seen here, had hosted pig production for two winters and a summer of prolonged drought, when temperatures exceeded 35 degrees C. Viewed during early Autumn, the ground, displayed 80-90% grass coverage in the service radial and gestation paddocks. A few bare patches were noted around feed troughs and water stations, but there was little evidence of poaching and/or excessive rooting.

Establishing robust, pig-resilient grass cover takes at least 3 to 4 months – something landowners often underestimate. The longer a ley can be left to mature before the pigs are introduced, the more durable it will be throughout their occupancy.

"You have to plan for good ground cover, and that takes time, investment and some collaboration with the landowner. We've found that the longer the grass is given to establish, the deeper the roots are underneath, which makes for a stronger sward," says Rob.

LSB now drills its own leys directly into stubble immediately post-harvest. This takes the pressure off their landlord's arable business during the busy cultivation period, and the more favourable weather/soil conditions during late summer/early autumn benefits grass germination rates. The new pig sward has some seven months to establish before the herd moves in the following spring, so its strong both above and below ground.

"This strategy works well, and our landlord supports what we're doing. We're working together so our herd moves onto well-established grassland, which is easier to manage and, after two years pig activity, still leaves a decent swathe of green cover when they move off," says Rob.

Nutrient rich with environmental benefits

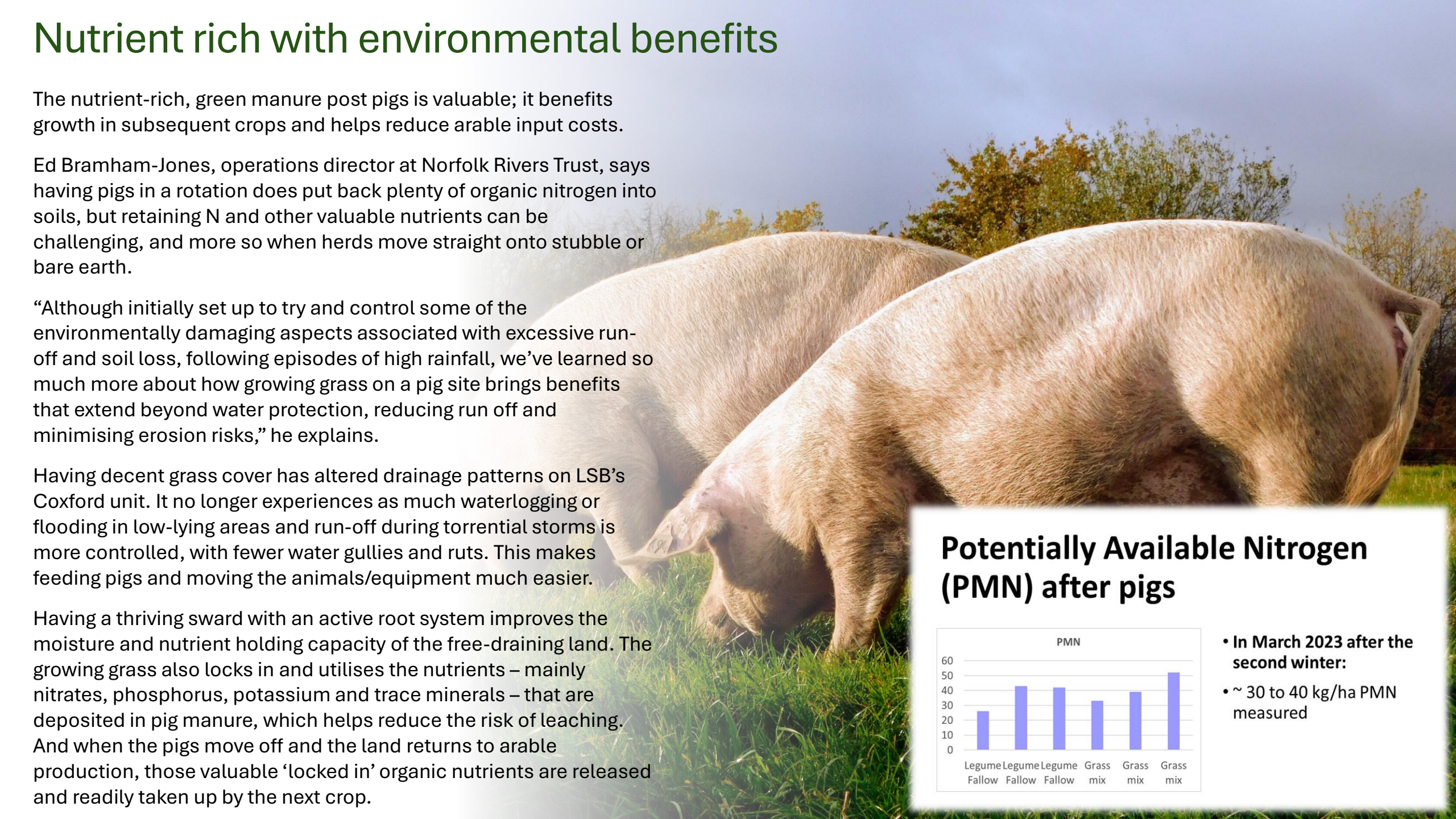
The nutrient-rich, green manure post pigs is valuable; it benefits growth in subsequent crops and helps reduce arable input costs.

Ed Bramham-Jones, operations director at Norfolk Rivers Trust, says having pigs in a rotation does put back plenty of organic nitrogen into soils, but retaining N and other valuable nutrients can be challenging, and more so when herds move straight onto stubble or bare earth.

“Although initially set up to try and control some of the environmentally damaging aspects associated with excessive run-off and soil loss, following episodes of high rainfall, we’ve learned so much more about how growing grass on a pig site brings benefits that extend beyond water protection, reducing run off and minimising erosion risks,” he explains.

Having decent grass cover has altered drainage patterns on LSB’s Coxford unit. It no longer experiences as much waterlogging or flooding in low-lying areas and run-off during torrential storms is more controlled, with fewer water gullies and ruts. This makes feeding pigs and moving the animals/equipment much easier.

Having a thriving sward with an active root system improves the moisture and nutrient holding capacity of the free-draining land. The growing grass also locks in and utilises the nutrients – mainly nitrates, phosphorus, potassium and trace minerals – that are deposited in pig manure, which helps reduce the risk of leaching. And when the pigs move off and the land returns to arable production, those valuable ‘locked in’ organic nutrients are released and readily taken up by the next crop.



Potentially Available Nitrogen (PMN) after pigs

- **In March 2023 after the second winter:**
- ~ 30 to 40 kg/ha PMN measured

Structural soil improvements

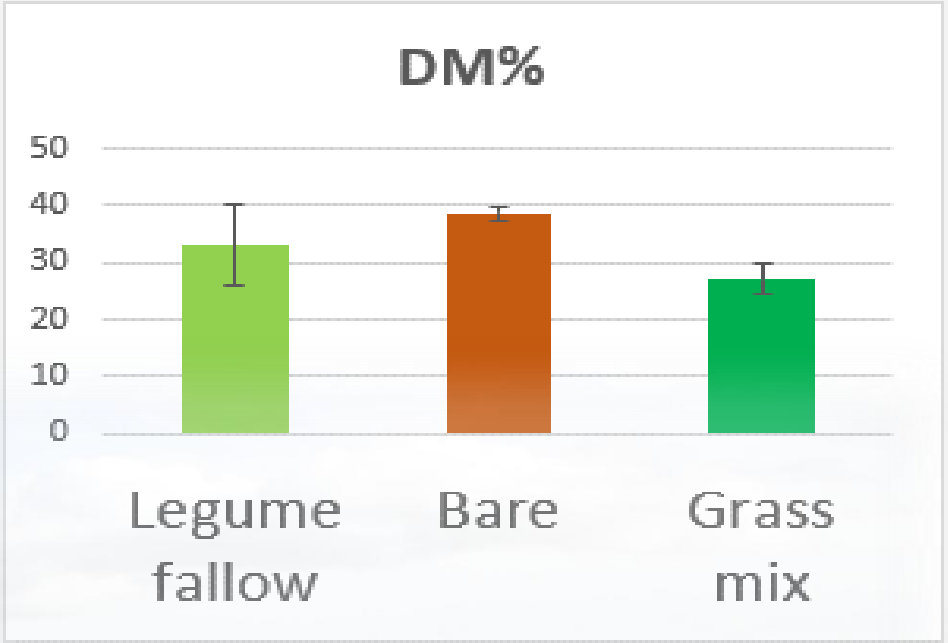
Fiona Wood, catchment scientist with Anglian Water has been monitoring soil structure and nutrient concentrations at the Coxford site for several years. The data collected from the pig mix comparison trial indicates that maintaining cover in pig paddocks protects soil structure and how, when the conditions are extreme, an established root system can 'survive' below the surface and help preserve soil health and nutrient levels.

Physical assessments taken in all seasons throughout the trial suggest that allowing pig paddocks to rest and re-establishment during production certainly helps to maintain green cover and promote deeper root development – characteristics that will lessen nutrient loss and help protect ground water quality.

The change in dunging behaviour alone delivered a more even distribution of organic nutrients across each paddock – a factor that's likely to reduce the occurrence of nitrate-heavy hotspots and associated cereal lodging in subsequent cultivations.

Initial analyses after the first year (September 2021) showed no measurable differences between sows managed on either of the two leys (see chart: green bars), although the dry matter content of droppings from sows on grass, compared with those on bare ground sites, was consistently lower. The grass-based dung samples also contained a higher percentage of organic matter.

Regular soil sampling throughout the 3-year trial demonstrated continual improvements to soil nutrient levels and how having grass cover improved soil mineral Nitrogen (SMN) enabling it to build up over time.



Paddocks that were weedy with bare patches (mostly the legume/herb ley) were capable of accumulating N, especially if conditions were dry over winter, but the paddocks sown with the CRF-based seed mix demonstrated better nutrient retention and greater resilience to pig activity during winter months.

Although SMN levels naturally fluctuate on free-draining soils – depleting during winter months where green cover was poor – an overall increase was achieved during the trial. Analyses found SMN to be up by 50 kg/ha on average and when samples were read in March 2023, following the second winter, the Potentially Available Nitrogen (PMN) on all paddocks that had accommodated pigs was measured at between 30 to 40 kg/ha (*see previous slide*).

Next steps… defining agronomic and economic values

The data collected from LSB's trail indicates how soil nutrients do tend to dissipate more readily during wintertime when green cover/root structure is poor. And, although N build-up in the soil during the autumn appears to be less under grass in the winter, Fiona Wood suggests that it does seem to be more stable, even during wet conditions. A significant amount of N continues to be held in the green biomass. This is a valuable nutrient reserve that would subsequently be released throughout following seasons.

Ms Wood says further investigations are needed to determine how these grass swards are retaining this additional nitrogen and when these nutrients are released. But what this trial certainly indicates is how very useful levels of Nitrogen are left in the soil after pigs, and that they can be more readily stabilised if green cover is maintained during pig production.

The next phase of this collaborative project will consider how arable farmers can successfully access these valuable nutrients effectively to minimise nutrient loss and optimise their agronomic value on subsequent cropping. The timing of sward destruction and cultivation will be significant here.