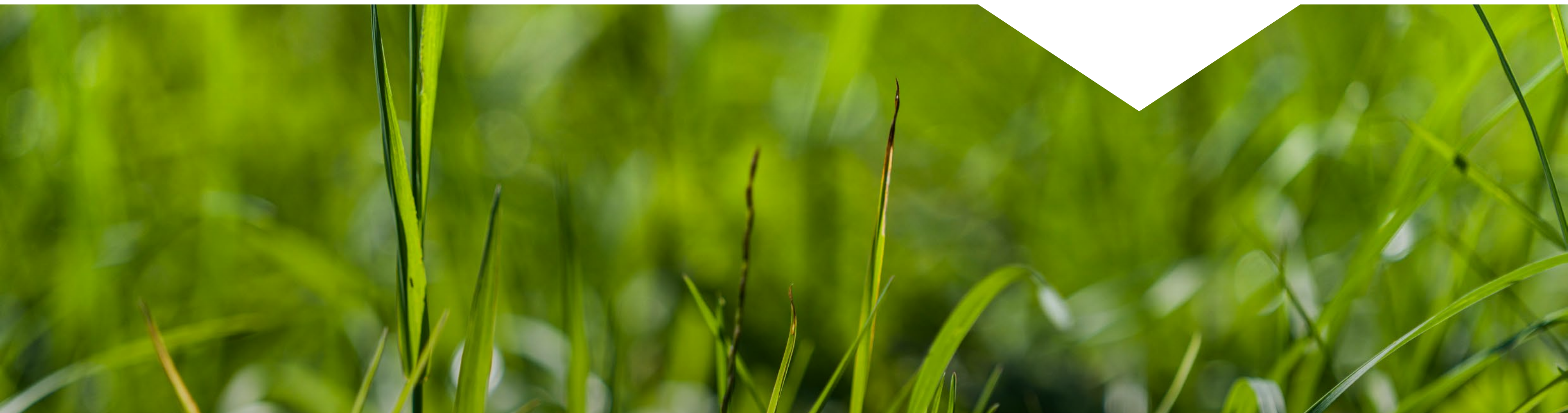
Building resilience in productive grassland systems

Regenerative agriculture is a form of agriculture designed to help address the critical issues around environmental sustainability on farms. As environmental concerns become more pronounced globally, finding innovative ways to reduce farm emissions, address climate change, and tackle biodiversity loss, while ensuring food security and economic stability for farmers in Scotland is growing in importance.

Increasing uncertainty around input costs, alongside more extreme weather patterns, has sparked interest in more sustainable farming practices. Regenerative agriculture, for example, focusses on restoring diversity and rebuilding ecosystem health thereby enhancing the natural processes that underpin food production. Healthy soils with a high organic matter are more effective at storing water and recycling nutrients, clovers within swards capture nitrogen from the air, a diverse army of natural enemies act as a first line of defence against pests such as leatherjackets and slugs, and a multitude of decomposers break down dung returning nutrients back to the soil. Working with nature, can therefore help reduce input costs, and increase the resilience of farming systems.

Rather than a set of prescriptive management practices, regenerative agriculture should be considered as a toolbox of practices that farmers can draw from depending on their needs, location, and farming system. Regenerative agriculture should not be viewed as a return to traditional, low input systems, but rather a means of integrating knowledge of natural processes with advancements in precision farming. Regenerative agriculture allows us to optimise the inputs that nature provides us with for free (water, sunlight, nutrient recycling, natural pest control) and in combination with new technologies can enhance the efficiency of external inputs (e.g. inorganic fertilisers, herbicides).



Working with nature

Multi-species swards

Multi-species swards support a diversity of different plant species targeted to complement each other and enhance soil health. These plants have different root structures and depths allowing species to access nutrients throughout the soil profile. Their different leaf shapes and plant heights ensure the sward captures the sun's energy more efficiently. Multi-species swards are associated with increased productivity and nutritional value, resulting in higher milk yields and increased milk solids[1]. They are particularly beneficial under low inputs of inorganic fertilisers[2] where they outperform ryegrass swards.

Grass-clover swards are particularly sensitive to drought and with Scotland predicted to see a rise in drought episodes, multi-species swards could help farmers mitigate the impacts of climate change. With plant species differing in their response to environmental extremes, multi-species swards can maintain grassland yields under varying conditions. Selecting species that work together is important, and mixtures should include nitrogen-fixing species such as red clover and deeper rooting species such as chicory. The The Farm Advisory Service (FAS) multi-species grassland sward tool can help you determine the best combination of plants based on your soil characteristics (e.g. pH, soil type), rainfall and main use (e.g. silage, grazing).

Alternative grazing sysems

Adaptive multi-paddock grazing, mob-grazing or tall grass grazing, are types of rotational grazing that focus on grazing small paddocks at high livestock densities and leaving long rest periods between grazing episodes. These systems mimic wild ruminants, which typically

move about in large herds. Typically, fields are subdivided into strips, or small paddocks, using electric fencing and livestock are moved as often as twice a day, depending on grass growth.

Adaptive multi-paddock grazing is associated with more extensive, deeper root systems, increased litter mass and higher water infiltration rates[4] and farmers who practice alternative grazing report that their swards are more resilient to drought. The longer rest periods between grazing episodes may also help to reduce parasite burdens. Adaptive multi-paddock grazing does require investment in electric fencing (and if desired self-release gates to automate some moves) and water provisioning in paddocks – for example through abstraction or pumping systems.

Hedgerows, shelterbelts and agroforestry

The inclusion of hedgerows, shelterbelts and trees within grassland systems can provide a wide range of benefits. Hedgerows are a much-loved feature of the British countryside, and their value to wildlife is undisputed. They provide shelter and nesting sites for a range of species, including yellowhammers, voles, bumblebees and butterflies. They form 'nature networks' through our countryside, creating physical connections between habitats and providing linear features that species such as bats and barn owls hunt along.

Woody vegetation sequesters and locks up carbon, and insetting carbon through woodland and hedgerow creation can help farmers reduce their carbon footprint. The woody vegetation can sequester and store carbon both above and below ground[5] with hedgerows increasing soil organic carbon by 31 % in grassland systems.[6]

In providing shade and shelter, trees, shelterbelts and hedgerows also enhance animal welfare, positively impacting on production by reducing heat stress in cattle and exposure in new born lambs.

Precision technology

Activity monitors

More farmers are using activity monitors to monitor the health and welfare of their herd. These movement sensors use the same technology as Fitbits, measuring the time an animal spends resting, feeding and ruminating. A change in behaviour can act as an early warning system for diseases such as lameness and mastitis. Early detection allows for rapid treatment with positive implications to welfare and production. Furthermore, with cattle being herd animals, contented herds are synchronised in their behaviours. Monitors can be used to look at how synchronised a herd is, with a high rate of synchronisation indicating that the animals are free to behave as they wish, providing a positive indicator of welfare.

Sensors to optimise efficiency

A variety of sensors are available that can help farmers ensure more efficient use of inputs and grazing pastures. Plate meters that are GPS enabled allow farmers to rapidly map grass cover across a farm helping farmers determine the availability of forage and optimise stocking densities. Such sensors also help to identify problematic areas that are underperforming – for example due to compaction or soil fertility issues. Optical sensors that measure the light reflecting from the sward can help target inorganic fertiliser requirements, increasing the efficiency of inputs and reducing the risk of diffuse pollution.

Advancements in farm machinery has also opened up new avenues. GPS guided tractors allow farmers to confine vehicle movement to dedicated lanes limiting the area of soils compacted by machinery. The use of controlled farm traffic benefits soil structure and has been found to increase grass yields by approximately 13.5%[8]. Through the use of precision agriculture, grassland farmers can better manage nutrient inputs, and alter stocking densities to improve grass utilisation to optimise live weight gain/milk yield.

While precision agriculture and regenerative agriculture may be seen as two very different ends of the spectrum, the two approaches complement each other. Nature and technology both have a role to play in building farming systems that are efficient, resilient to environmental and economic shock, and economically viable.

Maxwelston Farm

David Whiteford has a productive sheep and beef enterprise at Maxwelston Farm, South Ayrshire. David innovatively combines technology with more nature-based solutions to manage his grazing ground more efficiently, reduce input costs and increase profit margin. Maxwelston supports a wide variety of different grasslands, from upland rough grassland to multi-species swards in the lowlands. The multi-species swards combine a variety of grasses and herbs including plantain, chicory and clover. The nitrogen-fixing clovers reduce the need for inorganic fertilisers, and chicory with its deep roots can access water and nutrients deeper in the soil. David has noticed that these are more resilient to periods of drought highlighting their potential to help farmers mitigate the impacts of climate change.

At Maxwelston farm, David has reduced the cost of winter feed through outwintering his cattle by practicing deferred grazing in his hill ground. To manage his upland pastures more efficiently, David invested in no-fence collars, which use GPS technology to create virtual fences throughout the farm. These collars not only help David locate his cattle more easily on the hill, but also allow him to move his cattle on a daily basis ensuring optimum use of the grazing ground. When outwintering, David supplements his cattle with bale grazing to maintain condition.

Oakwood Mill

Giles and Stuart Henry farm at Oakwood Mill where their low input - high output, beef system focusses on the efficient use of lowland and upland pasture. Giles and Stuart operate deferred grazing on their hill ground. The free draining hill ground alongside hardy native Luing cattle has allowed them to move from summer to winter grazing. In the absence of summer grazing, their hill ground has become a haven for wildlife with orchids, butterflies and birds thriving.

During spring and summer, Stuart and Giles practice adaptive multi-paddock grazing in their lowland fields. The fields are divided into small paddocks and grass growth is carefully monitored, and cattle moved every 2-3 days to maximise the use of forage. To further increase the resilience to drought they have moved to longer rest periods (i.e. 42 days).

Giles and Stuart are part of the GrassCheckGB network of farmers and monitor their grass growth weekly, analysing the quality and mineral of their grass on a fortnightly basis. Their results feed into a GB wide database that helps to inform grassland farmers on actions to improve the efficiency of grassland management. This database allows Giles and Stuart to benchmark their farms performance, and using FarMax they are able to model different stocking densities and grazing scenarios. Through altering their grazing patterns and using tools to optimise grazing, Oakwood Mill has gradually increased their herd size.

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Where to find more information:

www.fas.scot/downloads/grazing-for-profit-and-biodiversity-multi-species-swards/

https://www.sruc.ac.uk/media/e24nyng4/outwintering-strategies-booklet-497866-sep-2022.pdf

https://www.nature.scot/landscapes-and-habitats/habitat-types/farmland-and-croftland/hedgerows-and-field-margins

https://www.fas.scot/publication/hed

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