Building resilience in low input grassland systems

Why regenerative agriculture?

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.

Regenerative agriculture offers a method of farming that improves ecosystem health alongside farm efficiency and is key to building Scotland's natural capital, while supporting resilient rural communities and moving towards self-sufficiency in food production.

Extensive agriculture systems - ecosystem services

Extensive grassland systems in Scotland are typically low input systems and as they are constrained by environmental conditions, they are relatively unproductive. Such systems are challenging to manage and can require significant time, labour and thought. We are beginning to recognise that the value of these systems extends far beyond food production and extensive farmland supports a wide range of public goods including:

- Food production
- Carbon sequestration
- Water quantity and quality
- Nutrient cycling

These services can be enhanced through different forms of regenerative agriculture including agroforestry, alternative grazing practices and use of native breeds

Find out more about ecosystem services

Regenerative agriculture focusses on restoring ecosystem health to enhance ecosystem services. This can result in greater benefits to wider society who rely on these services, as well as providing additional benefits to agricultural production. This is achieved when practices, such as: pasture management, habitat restoration, agroforestry and improving soil health, create more resilient ecosystems that can withstand fluctuations in environmental conditions and enhance economic stability.

Regenerative agriculture can take many forms and does not need to be as black and white as regenerative or non-regenerative. Rather, it can be viewed as a spectrum, where different aspects can be employed to fit an agricultural system.

Rather than taking a prescriptive approach, regenerative agriculture puts the farmer's knowledge at the heart of decision making. Often regenerative agriculture is associated with five core principles (i.e. keep the soil covered, minimise soil disturbance, continual living roots, promote farm diversity and integrate livestock grazing). These principles primarily relate to arable or mixed farming systems, and extensive systems by their nature already adopt many of these principles. Indeed, many extensive farmers cannot easily access their land with farm machinery to plough or fertilise their land. Rather than using artificial inputs, extensive farmers strongly rely on the natural processes that underpin production. Advances in technology, management and research can help extensive farmers enhance the ecosystem services their land provides alongside optimising profitability.

Working with nature

Alternative grazing regimes

While regenerative practices are typically more applicable to arable systems, a number of options exist for grassland farmers. These actions typically focus on restoring natural processes (e.g. nutrient cycling, diverse plant communities, species interactions).

Alternative grazing regimes can improve soil structure, water filtration and increase grass diversity. Mob or adaptive multi-paddock grazing involves grazing tall grass for short bouts, and leaving the grass to rest between episodes. Scientific studies have shown how these alternative grazing regimes can enhance carbon and water retention in the soil and increase the quantity and quality of the forage.

Healthy soils, with good structure, high organic matter and diverse communities of flora and fauna, support the recycling, uptake and retention of nutrients.

They store and regulate waterflows helping farmers combat drought and flooding, offering natural land management options in our changing climate.

Alternative grazing regimes can require initial outlay with respect to electric fencing, and provisioning of alternative watering systems. They also require considerable thought as to how paddocks should be established and if it is desirable to split the herd into different groups. As these systems can limit livestocks natural movement, it is also important to consider weather conditions, and ensure access to shelter/shade where necessary.

Mob/Adaptive multi-paddock grazing: High livestock densities for short durations with long rest periods. Balsar Glen.

Deferred grazing: Setting aside pastures in summer to allow for areas to be grazed overwinter. This method allows plants to flower and take seed. Oakwood Mill.

Bale grazing: Supports outwintering cattle using bales. Bales are rolled out to supplement winter feeding. Grampian Graziers and Edinvale Farm.

Creep grazing: Young livestock access higher quality pasture through dipping below the electric fence. Allows calves to become more independent. Edinvale Farm.

Alternative grazing case studies

Grampian Grazers

Grampian Graziers are restoring species-rich grasslands at Highlands Rewilding's Beldorney Estate through Bale Grazing. Nikki and James Yoxall have harvested bales of hay from a nearby nature reserve. These seed laden bales, not only provide additional forage, but also act as huge seed bombs, which the cattle trample into the ground. Already they are seeing plants such as yellow rattle, which are indicators of species-rich grasslands. With plant species responding differently to environmental extremes such as drought or water logging, restoring plant diversity can help farmers build resilience to climate change into their systems. Restoring grasslands with native plants that are locally sourced provides as cost effective means of restoring botanical diversity and also ensures that plant communities are suited to the local wildlife.

Balsar Glen

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Heather farms with her dad, Philip Close, at Balsar Glen in Ayrshire. Heather and Philip focus on high quality grass-fed Angus and Hereford cattle. They have moved away from inorganic fertilisers, and in the absence of artificial inputs native plants have flourished. Their pastures provide a mix of grass species, interspersed by a diversity of flowers including nitrogen fixing legumes such a bird's foot trefoil, vetches and clovers. Their hardy native breeds, alongside healthy soil and diverse swards, enables Heather and Philip to outwinter their cattle. They move their cattle up to three times a day, grazing in small paddocks, with long rest periods (3 months) between grazing. The long rest periods have meant they rarely need to use wormers and the rich mosaic of different grass heights across the farm supports a diversity of wildlife. Heather sells their 100% grass fed beef directly to consumers which means they are able to get a premium for their produce. This premium, alongside their low input costs ensures a healthy profit margin.

Technology

Historically, advances in technology have revolutionised agriculture. In the past these have focused on optimising yield and reducing physical labour through mechanisation. However, now there is a much greater focus on technologies that increase the efficiency of inputs to enhance sustainability and optimise profit margin. Extensive agriculture has the opportunity to embrace these, with the potential to facilitate the adoption of regenerative agriculture.

UAV imaging

Unmanned Aerial Vehicles (UAVs) imagery such as drones have seen a rapid increase in uptake recently due to their realised potential to automate time consuming tasks and collect data previously unavailable. It is estimated that approximately 18% of agricultural businesses in the UK are already using drones. The main use of drones is currently within arable systems, where they can be used to collect a large amount of crop data in a relatively small amount of time. However, a growing amount of research is currently looking at how UAVs can be used for livestock management.

The use of UVAs is likely to become specifically useful in extensive hill systems, where finding and checking on livestock can be labour intensive. Whereas UAVs can cover large areas of otherwise challenging terrain and provide up to date information on livestock location and health. To ensure welfare, drones should be used to help locate livestock, whilst checks should still be conducted in person. As drone technology continues to develop land managers can utilise these resources to help feed into natural capital assessments, habitat and biodiversity monitoring and carbon stores.

Virtual fencing

Virtual fencing allows the control of livestock without the use of conventional fencing. One method, which has gained significant traction recently is the use of 'no fence collars'. No fence collars work through attaching a collar around the neck of livestock and setting up virtual boundaries using GPS. The collar can detect when the cow is approaching the boundary and will produce an audio signal to warn the animal, this sound may increase in volume / frequency the closer to the boundary the animal gets. Once the animal reaches the boundary it will receive an electrical pulse to deter it. Livestock soon learn to associate the audio signal with the electrical pulse – learning to change direction.

A study completed by SRUC found no fence collars prevented animals from crossing virtual fence lines, without impacting on the animal's general activity[1]. As well as acting as a management tool, the collars have proven to be useful in tracking animals' location and behaviour. Virtual fences can be used to contain livestock within farm boundaries and can be used to fence off dangerous ground (e.g. steep inclines, bogs, or roads). The collars can also be used to optimise the use of forage in upland situations making strip or mob grazing more viable.

Virtual fencing is particularly valuable for farms undertaking conservation grazing in sites designated for wildlife. The collars allow more precise management of livestock, to graze areas in line with grazing management strategies to deliver conservation outcomes. Though these collars can be beneficial for some farming systems, they may not be suitable for all. The drawbacks include initial startup costs, which are significantly more than the cost of a traditional electric fence. Furthermore, there is some fluctuation in the location in the GPS boundary due to the accuracy of GPS signal, this may be only a couple of meters, which doesn't make a huge difference on a hill side, however, could be more noticeable on smaller pasture fields.

Automated sensors

Animal mounted motion sensors, like those in FitBits or other fitness trackers, can be used by farmers to detect heat stress and early stages of disease, to allow more precise treatment and reduce the use of antibiotics.[2] Famers can detect the time a cow spends lying, eating or ruminating, and use this to score their welfare.

Promote farm diversity

Agroforestry

Agroforestry is the integration of trees and shrubs into agricultural land. The integration of trees can have multiple benefits to both agricultural output and the enhancement of natural capital across a farmland. Agroforesty can also diversify income streams and benefit agricultural productivity. The direct economic benefits of incorporating trees into an extensive livestock system come from the increased shelter and alternative foraging opportunities, resulting in greater livestock weight gain and lower mortality. Agroforestry also achieves many of the principles of regenerative agriculture through increasing water infiltration, nutrient cycling and soil organic carbon. Agroforestry thus helps to provide additional public goods (e.g. natural flood management, carbon storage and biodiversity enhancement), alongside more resilient landscapes for food production.

Agroforestry can be achieved in multiple ways, through either silvopasture, which is the inclusion of trees within a field itself, or utilising trees along the edge of fields through shelter belts, hedgerows and riparian buffer strips. The extent in which agroforestry can be utilised will vary between farms and within farms, however, some level of adoption can be used to trial the benefits and help farmers reduce their carbon footprint. Agroforestry schemes are funded through the Scottish Government, offering options such as 150 - 200 trees or 400 trees planted per hectare. This comes with an initial grant rate for installation and a 5-year maintenance payment.

Land restoration

Regenerative agriculture focuses on restoring ecosystems to increase the services they provide. One such example of a damaged habitat that occurs across many of Scotland's extensive agricultural systems, is peatland. Peatlands in good health are a valuable carbon store, as well as holding a significant amount of water, and providing habitat for a wide range of species. However, currently 80% of Scotland's peatlands are damaged, and emit approximately 20% of Scotland's total carbon emissions. For this reason, we are

now recognising the value of these habitats in helping Scotland meet its net zero emissions target. To fund this, the Scottish Government have set up a taskforce (Peatland Action) to deliver peatland restoration projects and has pledged £250 million to restore 250,000 hectares of peatland by 2030. Projects can receive funding through Peatland ACTION to restore their peatland, and if they meet the right criteria there is the potential to claim carbon credits through the Peatland Code. This carbon credit accreditation scheme was set up by the IUCN. This provides economic incentives for farmers on extensive systems to increase the natural assets on their farm.

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Further information

www.farmingforabetterclimate.org/soil-regenerative-agriculture-group

www.fas.scot/crops-soils/soils/regenerative-agriculture

www.soilassociation.org/our-work-in-scotland/scotland-farming-programmes/resources-for-farmers/grassland-management/higher-output-with-regenerative-grazing/

Where to find more information:

[1] Umstatter, C., Morgan-Davies, J., & Waterhouse, A. (2015). Cattle responses to a type of virtual fence. Rangeland Ecology & Management, 68, 100 - 107. https://doi.org/10.1016/j.rama.2014.12.004

[2] earth.google.com/earth/d/1MqXE9J7oR3PtfIgwASbTX9SP_Coivypf?usp=sharing

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