Nature Means Business

How regenerative farming in Wales is making farms more financially resilient and improving the environment

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Rhwydwaith Ffermio er Lles Natur

Nature Friendly Farming Network

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Introduction

Farming is hugely significant in Wales. Approximately 90% of the total land area is used for agriculture[1], so decisions by farmers and landowners can have far-reaching effects on land use, food production, the physical landscape, climate, wildlife and habitats.

Welsh agriculture and horticulture produce a range of high-quality food and drink products, primarily lamb and beef, but also dairy products, cereals, eggs, vegetables, fruit, fungi, cider and even wine. At the same time, this is a landscape that attracts large numbers of day visitors and holidaymakers, and many areas are praised for their beauty[2]. Within the landscape, a variety of habitats – from upland heather moorland and blanket bog to hay meadows, native woodland and coastal marsh – provide homes for many iconic and globally important species, as diverse as waxcap fungi and otters. Meanwhile, the farming community makes an important contribution to the social, cultural and linguistic[3] fabric of Welsh society.

However, there are many challenges facing Welsh farmers:

- A signifcant proportion of Welsh farmland (79%) has Less Favoured Area status[4], meaning that physical and socio-economic characteristics result in higher production costs and / or lower returns compared to those farming at lower altitudes, or who have better access to markets.
- Farming is already feeling the effects of climate change. Flooding, storms and droughts contribute to increased soil erosion, pest and disease outbreaks[5], slope failure, and soil heave[6], hindering farming's resilience.
- Wales is one of the most nature-depleted countries in the world[7], with wildlife species being lost at an alarming rate[8] and most habitat types declining in diversity, extent and condition[9]. This is important for farming: as well as nature's moral right to exist, biodiversity is indispensable to the supply of many ecosystem services upon which agriculture depends[10]. These include climate and water regulation, pollination, heathy soils and shelter. The link between environmental sustainability and food security is also being increasingly recognised[11], with the recognition that food security is much more complex than simply producing more[12].
- The economics of farming are persistently challenging, with the industry being extremely dependent on public sector support through agricultural payment schemes. The average Welsh farm derives only 20% of its income from agricultural production, and 67% from basic and agri-environmental payments[13]. Globalised market systems are unstable, and fail to recognise and fairly reward most agricultural products, with the drive for "cheap" food driving farm-gate prices down. Farm inputs price rises add to the pressure on farm finances, by increasing costs without necessarily resulting in improved profits.
- The changing policy landscape, and in particular the tendency for policies to be short-term compared to the needs of agriculture, make it difficult for farmers to plan ahead.
- Farmers and agricultural workers continue to work in a job renowned for its long, anti-social hours, difficult conditions and isolation. The number of organisations and campaigns set up to support this sector is a testament to this need[14]—these range from practical on-farm help to managing mental health.

Complex though these problems are, nature-friendly farming can supply answers. It seeks to address these issues together, building long term food security while taking action on the nature and climate crises. This report presents two approaches farmers can adopt to be part of the solution – regenerative farming techniques and the economic idea of Maximum Sustainable Output (MSO).

Agricultural policy in Wales

Following the UK's exit from the European Union and, therefore, the Common Agricultural Policy (CAP), the Welsh Government is redesigning agricultural policy in Wales. This redesign will have a focus on producing food alongside providing environmental goods and services. Measures include mitigating flooding and addressing climate change through on-farm activities and various other actions, from business performance analysis to safeguarding biodiversity and measuring soil health. Nature-friendly farming helps to prepare farmers for this transition.

[1] Devenish, K. (2022) The farming sector in Wales: research briefing Cardiff: Welsh Parliament https://tinyurl.com/3pudk4wt
[2] The Welsh landscape was cited as a key motivation for 54% of UK day visitors and 67% of staying visitors in 2016 - Welsh Government (2019) Agriculture in Wales Cardiff: Welsh Government. p.7 https://www.gov.wales/sites/default/files/publications/2021-03/agriculture-in-wales-evidence.pdf
[3] According to the 2011 census, 43% of workers in the agricultural, forestry and fishing sector speak Welsh; the highest proportion of any employment sector – op cit., p. 12.
[4] Statistics for Wales, 2022. Farm incomes in Wales, 2020-21 https://tinyurl.com/bdepbhhr
[5] Rojas-Downing, M., Nejadhashemi, A.P., Harrigan, T. and Woznicki, S.A. (2017) "Climate change and livestock: impacts, adaptation, and mitigation" Climate Risk Management 16, pp. 145-163 https://tinyurl.com/yc79jsvx
[6] From the National Trust's Hazards Mapping tool: more information - https://www.3keel.com/climate-risk-mapping/ ; the tool itself - https://national-trust.maps.arcgis.com/apps/webappviewer/index.html?id=a44672bb34c4491a909034d0eed76583
[7] RSPB (undated) Biodiversity loss: the UK's global rank for levels of biodiversity loss https://tinyurl.com/2dn43xhd For more information on the Biodiversity Intactness Index, see the Natural History Museums' Predict project: https://www.nhm.ac.uk/our-science/our-work/biodiversity/predicts.html.
[8] For example, one in six species are at risk of extinction (State of Nature Partnership (2019) State of nature: a summary for Wales https://nbn.org.uk/wp-content/uploads/2019/09/State-of-Nature-2019-Wales-summary.pdf, while numbers of farm birds have declined significantly since 1994 (Bladwell, S. et al. (2018) The state of birds in Wales 2018 The RSPB, BTO, NRW and WOS. RSPB Cymru: Cardiff).
[9] Natural Resources Wales (2020) State of Natural Resources Report (SoNaRR) for Wales 2020 Aim 2: Ecosystems are resilient to unexpected and unforeseen change https://tinyurl.com/5n7vmn74
[10] Bélanger, J. and Pilling, D. (Eds.) (2019) The state of the world's biodiversity for food and agriculture FAO Commission on Genetic Resources for Food and Agriculture Assessments: Rome https://tinyurl.com/2ffu4fzh
[11] High Level Panel of Experts on Food Security and Nutrition (HLPE) (2020) Food security and nutrition: building a global narrative towards 2030 – Executive summary FAO https://www.fao.org/3/ca9731en/ca9731en.pdf
[12] See Rethink food: the need for change by the NFFN https://tinyurl.com/msdw2wxf p.5 for the dimensions of food security,
[13] Devenish (2022) op cit., pp. 17-18. Data from the Farm Business Survey 2020-21, which excludes very small and part-time holdings.
[14] Tir Dewi (established 2015) and the DPJ Foundation (2016) specifically work with farmers in Wales, while the Farming Community Network and Royal Agricultural Benevolent Institution work throughout the UK.

What is Nature-Friendly Farming?

Nature-friendly farming recognises that farmers play a vital role in delivering many essential goods and services: food, fibre, nature, flood mitigation, carbon sequestration, water quality, community vitality and public access to the countryside.

Without farmers and farmland, meeting our nature and climate goals will be impossible. It recognises that production is essential, but not at any cost. Nature-friendly farming can help farmers enhance their contributions to the environment, food systems and wider society and improve their farm profitability and personal wellbeing. The first step is recognising that nature is a central partner in sustainable, long-term food production.

Nature-friendly farming:

- Works with nature, rather than against it;
- Produces diverse, nutrient-rich and healthy food for people to eat;
- Is resilient against external shocks;
- Reduces carbon emissions and sequesters carbon in soils and biomass;
- Protects and enhances biodiversity everywhere, seeing nature as an ally;
- Seeks to find the optimum balance between productivity and nature to ensure that natural assets are not degraded, and profitability is not reduced.

Nature-friendly farming is regenerative, circular, low waste, agroecological, low input, resilient, locally-contextual and diverse.

However, nature-friendly farming is more than a philosophical idea – it is extremely practical, and there are many real on-farm actions that can be taken. These include significantly reducing or eliminating potentially damaging bought-in inputs, reducing soil tillage and ensuring that soil is not left exposed to the elements, and creating habitats that help nature and the farm's resilience by benefiting livestock and crops.

Much useful advice is available from the Nature Friendly Farming Network and several tools and frameworks can help farmers decide which actions are most appropriate for them. Two of these are regenerative farming (for practical actions to help nature and the farm) and Maximum Sustainable Output (for re-thinking and optimising the farm business' finances by bringing nature into the system).

Helping nature and the farm: *Regenerative farming principles*

Regenerative farming / agriculture is not a new term – it was developed in the United States in the 1970s and 1980s, but fell out of use for many years, while terms like "sustainable", "organic" and "agroecological" increased in use[15].

Since it's re-appearance in the farming vocabulary, several definitions have appeared, all focusing on improving soil health.

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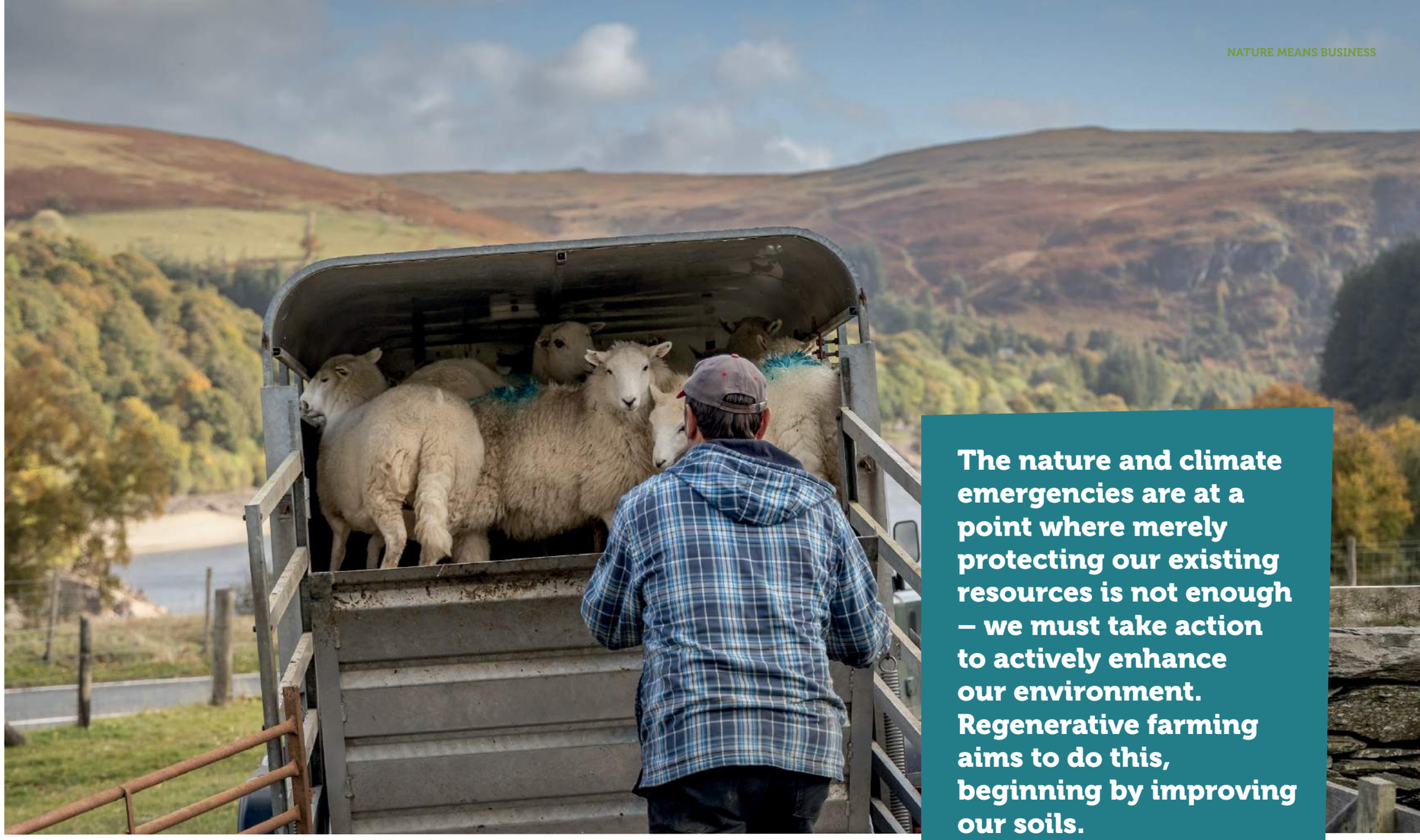

The nature and climate emergencies are at a point where merely protecting our existing resources is not enough – we must take action to actively enhance our environment. Regenerative farming aims to do this, beginning by improving our soils.

Commonly, five principles are used:

1. **Do not disturb the soil:**
good soil function depends on connectivity within its system of pores, spaces and life forms including fungal networks, which soil disturbance disrupts. Connectivity helps with nutrient cycling and the retention of water.

2. **Keep the soil surface covered:**
to regulate water entering the soil and the exchange of gases between the soil pore network and the atmosphere, protecting soil from the elements.

3. **Keep living roots in the soil:**
in addition to helping to protect the soil surface, living roots act to deliver carbon and energy below ground. Their presence also means that the mycorrhizal fungi, that have such a crucial role in soil and plant health, can continue to develop and work.

4. **Build diversity:**
systems with a variety of species, which are allowed to flower and set seed, are able to provide more complex habitats which aid biodiversity, help with system resilience and are able to carry out a broader range of functions. Deep-rooted plants are able to mobilise nutrients from further down the soil profile, whilst nitrogen fixing plants such as clovers and vetches can reduce the reliance on artificial fertilizers, saving costs.

5. **Bring grazing animals back to the land:**
animals occur throughout natural systems; managed effectively, they modify carbon and nutrient cycling, and aid with diversity[16]. In systems that already include livestock, a poor grazing regime can lead to erosion and flooding[17]. Undergrazing can also negatively affect biodiversity, particularly in upland Wales where the decline or absence of native cattle grazing has resulted in the dominance of purple moor grass (*Molinia caerulea*).

Two further principles are also seen:

6. **Feed soils with organic matter:**
with compost or manure

7. **Minimise chemicals and synthetic inputs:**
including pesticides, herbicides and artificial fertilisers.

[15] Miller, A. (2022) The many meanings of 'regenerative' agriculture Blog post, Sustainable Food Trust. https://tinyurl.com/3cjju65v
[16] based on work by Prof Karl Ritz, Emeritus Professor of Soil Ecology, University of Nottingham and presented at Groundswell, https://groundswellag.com/karl-ritz-the-groundswell-5-principles-and-soil-sense/
[17] See comment by John Cherry, Groundswell host farmer, https://groundswellag.com/principles-of-regenerative-agriculture/

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Techniques

Within the broad principle of protecting and enhancing soil health and encouraging biodiversity, there are a variety of practical techniques.

Many of these techniques are mutually reinforcing and work best in combination with others; for example, avoiding artificial fertilisers may also require a change in grazing system. A whole farm approach is needed to deliver benefits across the system. This list contains only some regenerative techniques, and they may not all be suitable for every situation, so farmers should carefully consider which practices are best for each location.

- Reduce – and ideally avoid – the use of chemicals, including artificial fertilisers, herbicides, fungicides and other pesticides, and allow nature to regain its balance and provide its own pest control.
- In arable systems, use cover crops and green manures to help protect soils and build fertility, leave winter stubbles to help protect the soil and provide shelter and food for insects and birds over winter.
- Oversow or direct drill pasture, rather than ploughing and reseeding, if it is too degraded to be restored by resting alone.
- Diversify what is growing in your fields.
  For arable crops, try mixed cropping, and for improved livestock pasture, encourage more diversity through restoring species-rich grasslands or trying herbal leys with a mix of seeds that are suitable for your conditions.
  Even in well-established grassland, perennial wildflowers and different grasses can be introduced, ideally from local seed stock.
  Even better, allow them to recolonise naturally, by allowing grasses and flowers in some fields to flower and set seed before cutting or harvesting.
- Re-introduce livestock into arable rotations.
  It may be possible to arrange with a neighbour to graze their animals on your land.
- If you already have livestock, consider diversifying the types of animals kept, as their different grazing styles and manure will help create diversity in the sward and soil. Find the most suitable breed for your conditions, such as native, hardier breeds for rough, upland pasture. These usually require less feed than continental breeds, thereby also helping to reduce costs and related global impacts, such as rainforest deforestation in order to produce soya for feed.
- Monitor and manage grazing regimes carefully, tailoring them to local conditions, grazing pasture according to its carrying capacity, and including suitable rest periods. Rotational and mob grazing, rather than set stocking, may be appropriate. See Grazing Styles on page 12.
- Diversify the structure in your fields. Think about plants that have different depths and types of roots (tap or ‘bushy’ roots), and also different heights above ground. Chicory, yarrow, meadow fescue and cock’s foot, for example, are all deep rooting.
- Use trees where they would be of most benefit. Extend and restore hedges, plant up spare field corners with native trees, introduce field trees for shade, and protect stream sides from erosion using tree roots.
- Use cover crops and minimum tillage / no tillage systems in arable systems to avoid disturbing the soil, its structure and its associated fungal networks.
- Create room for nature throughout the farm, creating a mix of connected habitats.
  You may be able to:
  – restore wetland habitats, e.g., create ponds, re-block unused drainage, create streamside buffer strips, and protect and restore peatlands;
  – plant and appropriately manage hedgerows e.g., include hedgerow trees, lay hedges and coppice hedgerow trees, ensure a varied structure, cut less often, and delay cutting until late winter to leave berries, flowers and seed heads;
  – leave dead branches and trees in situ, where they do not pose a danger to the public;
  – allow natural tree colonisation and woodland regeneration.
- Watch for and repair damage to soils, such as compaction, poaching or overgrazing, as quickly as possible.

Finally:

- Allow time for nature to recover and re-balance itself and its natural processes. Results may not be immediately apparent but are often surprisingly quick.
- Monitoring will help you to see the effects of your actions. Many organisations may be able to help with this, including your local Wildlife Trust, FWAG or one of the conservation charities, as well as Farming Connect.
- Get help and advice, but do check the source. See the Further Reading and Resources section for more assistance.

GRAZING STYLES

Set Stocking

The practice of grazing livestock in a field for an extended period. Under such a regime the paddock is rarely rested. The stocking rate is usually calculated so that the maximum number of livestock can be grazed throughout the year.

Rotational Grazing

This works on the basic principle of 'graze and rest' – once a paddock is grazed, it is allowed to undergo a rest period, normally on a 21-day rotation. Compared with set stocking, it boosts pasture resilience by allowing the development of deeper rooting systems, therefore improving the soil structure and soil organic matter. This can lead to enhanced grass quality and quantity, as plants grow more quickly when they are rested after grazing, whilst also reducing the need for artificial fertiliser. It can also extend the grazing season, meaning that housing periods are reduced, resulting in cost savings.

Mob Grazing

Also known as Adaptive Multi Paddock (AMP) grazing, mob grazing is similar in principle to rotational grazing, but entails very short duration, high density grazing with a longer than usual rass recovery period. Livestock groups are moved frequently (1-3 days on average), and the grass can be left to recover for between 30 and 120 days or longer. During the growing season livestock are moved on a more regular basis, while things slow down during the dormant season.

Deferred grazing

This involves the removal of livestock from grassland in the summer to allow a grass wedge to build up for feeding in the dormant season, usually from November onwards. As autumn grass growth rates can vary considerably, you need to be flexible when it comes to when and how much land to set aside. Deferred grazing is sometimes supplemented with hay in a bale grazing system.

Bale grazing

This involves arranging several hay bales at a time in a paddock for grazing, then moving cattle daily to the next paddock, allowing the previous one to recover for the rest of the winter. A more common practice in North America, this approach is said to improve soil health and subsequent forage growth because of the trampling of uneaten hay and deposited manure. As an approach to outwintering cattle, this reduces the costs associated with housing cattle on a straw-based system.

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What does regenerative farming help achieve?

Good for farm finances

- Reducing or ceasing the use of inputs such as animal feed, artificial fertilisers, herbicides and pesticides can be a major financial saving on many farms without necessarily reducing yield[18]. Find out more in the next section "Maximum Sustainable Output: Easing the financial pressure".
- A healthy farm ecosystem will encourage natural predators to provide pest control services. Animals eating a more natural, varied and nutritious diet will be healthier[19], resulting in lower veterinary and medicinal costs, including fewer antibiotics and anthelmintics. Livestock in a more nature-rich and diverse environment will also be under less stress, leading to higher welfare standards[20].
- These systems are less susceptible to drought, so can help to safeguard forage during prolonged hot weather.
- Less money may be required to repair and mitigate against damage from external influences, including protection against new pests and diseases caused by disruption to natural regulatory systems, as well as physical repairs caused by floods, droughts and storms.

Good for people and food

- Healthier soils mean more nutritious food for animals (if they are pasture-fed and organic) and humans[21]. The importance of this for human mental, as well as physical health is just being realised[22].
- Food security is increased by avoiding dependence on imports, including inputs into the farm, particularly those that are dependent on the oil industry, such as fertiliser.
- Many regenerative techniques would be recognised by older generations of farmers, and may help to preserve appropriate traditional knowledge, skills and practices.
- The physical and mental benefits of connecting with nature are well documented[23]. These benefits are equally important for farmers, with many farmers reporting that the slower pace of farming with nature, rather than being production-driven, has helped them to feel more positive and enjoy farming. See the case studies for examples.

Good for biodiversity and the climate

- Soils are the foundation for other forms of biodiversity and essential in their own right for the many varied and fascinating life forms they contain.
- Dedicating at least 10% of the farm area to high quality habitats can help biodiversity recover[24].
- Temperate grassland soils are a major store of carbon[25], a significant greenhouse gas that contributes to climate change. Importantly, land management practices at the surface affect carbon storage at depths of up to a metre[26].
- Trees and other deep-rooted plants will help with water infiltration, bringing up nutrients and providing different habitats and provisions for wildlife.
- A healthy soil with a good structure absorbs and retains water, replenishing local groundwater supplies. This results in less soil erosion and loss from the farm, less nutrient leaching, and less overland flooding.
- Reducing chemicals on the farm means less pollution of soils, water and air allowing wildlife to thrive – from microscopic life in the soil and improved fungal connections to an increase in native plant life, pollinators, birds and mammals.

[18] See, for example: Farming Connect (2021) Trial shows only small grass yield drop from cutting summer nitrogen usage https://tinyurl.com/49sn6ven. Fredenburgh, J. (2022) "Farming with nature: does regenerative arable farming stack up financially?" Farmers Guardian https://www.fginsight.com/farmingwithnature/farming-with-nature-profitability?topics=Regenerative%20agriculture. Pywell, R. et al. (2015) "Wildlife-friendly farming increases crop yield: evidence for ecological intensification" Proceedings of the Royal Society B DOI: https://doi.org/10.1098/rspb.2015.1740. Redhead, J.W. (2022) "The effects of a decade of agri-environment intervention in a lowland farm landscape on population trends of birds and butterflies" Journal of Applied Ecology 59 (10) pp. 2486-2496 DOI: https://doi.org/10.1111/1365-2664.14246. Tamburini, G. et al. (2020) "Agricultural diversification promotes multiple ecosystem services without compromising yield" Science Advances 6 (45) DOI: https://doi.org/10.1126/sciadv.aba1715.

[19] French, K.E. (2017) "Species composition determines forage quality and medicinal value in high diversity grasslands in lowland England" Agriculture, Ecosystems and Environment 241 pp. 193-204. Abstract available: https://tinyurl.com/ycksvh7h.

[20] Most research has concentrated on organic systems, according to Markiewicz-Keszycka, M. et al. (2022) "Pro-environmental diversification of pasture-fed dairy and beef production in Ireland, the United Kingdom and New Zealand: a scoping review of impacts and challenges" Renewable Agriculture and Food Systems 38 https://doi.org/10.1017/S1742170522000382. For example, Lund, V. (2006) "Natural living – a precondition for animal welfare in organic farming" Livestock Science 2-3, pp. 71-81 DOI: https://doi.org/10.1016/j.livprodsci.2005.08.005. However, see also Smid, A-M.C. et al. (2018) "Dairy cow preference for different types of outdoor access" Journal of Dairy Science 101, (2) pp. 1448-1455 https://www.sciencedirect.com/science/article/pii/S0022030217311153.

[21] Butler et al. (2021) "Forage-fed cattle point the way forward for beef?" Future Foods 3 https://doi.org/10.1016/j.fufo.2021.100012; Montgomery, D. et al. (2022) "Soil health and nutrient density: a comparison of regenerative and conventional farming" PeerJ 10:e12848. https://peerj.com/articles/12848/

[22] Seal, R. (2021) "Unlocking the 'gut microbiome' – and its massive significance to our health" Guardian https://tinyurl.com/576hyv8m.

[23] Bragg, R., et al. (2015) Wellbeing benefits from natural environments rich in wildlife University of Essex & The Wildlife Trusts. https://tinyurl.com/2f4awkzu; Romanelli, C. et al. (2015) Connecting global priorities: biodiversity and human health – a state of knowledge review World Health Organisation and Secretariat of the Convention on Biological Diversity: Geneva, Switzerland https://tinyurl.com/ysu52bw2

[24] From several studies reviewed by Ricketts Hein, J. (2022) On-farm nature: 10% well managed for nature case studies RSPB Cymru and Nature Friendly Farming Network. Also Sharps, E. and Hawkes, R.W. (2023) "Reversing declines in farmland birds: how much agri-environment provision is needed at farm and landscape scales?" Journal of Applied Ecology [pre-print] https://tinyurl.com/4yk7xrup.

[25] Dondini, M., et al. (2023) Global assessment of soil carbon in grasslands – From current stock estimates to sequestration potential FAO Animal Production and Health Paper No. 187. Rome, FAO. https://doi.org/10.4060/cc3981en.

[26] University of Manchester (2016) "Huge carbon stores under grassland discovered" [Press release] https://tinyurl.com/477dpayn.

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Maximum Sustainable Output: Easing the financial pressure (MSO)

During and following the Second World War, farmers in the UK were encouraged to increase the amount of food they produced. This took many forms: in addition to the extra land that had been brought into cultivation, productivity and efficiency were targeted. However, this was only possible through major changes to farm technologies and food distribution, including the increased introduction of external inputs into the farming system. This was followed by decades of production-focused agricultural policies.

While the resulting environmental damage is now widely recognised, it is also clear that the financial benefits to farmers have been short-lived, especially for those in areas that are considered marginal. In 2020-21, the average farm income in Wales was £34,300 – the lowest of the four UK nations – two-thirds of which came from public money[27]. Increasing production levels do not necessarily equate to higher (or even any) profits.

The MSO concept

By bringing nature – specifically the natural capacity of the land to support production – back into the farm business, Nethergill Associates have developed a system that re-examines the costs of and potential for more *profitable* farming[28].

Farms are complex and interconnected biological systems. Therefore, unlike most manufacturing systems, increasing the inputs into an agricultural business does not necessarily mean that a higher level of outputs will be produced, and that there will be a related increase in profits. As farming becomes more intensive, additional costs are incurred to substitute for nature once its natural capacity has been reached, e.g., the provision of extra livestock feed to supplement naturally available grass. At this point, variable costs tend to rise at a faster rate than additional income is generated.

The MSO approach reviews all the financial data, particularly the farm's fixed and variable costs. Variable costs are further broken down into Productive Variable Costs (PVCs), which is where the business works within natural limits (e.g., hay / silage production), and Corrective Variable Costs (CVCs), which substitute for nature (e.g. bought-in feeds or fertilisers). From these, the MSO can be calculated. This is where the business is at maximum profitability and the farm's natural capacity is not exceeded. If farms operate beyond MSO, costs rise increasingly quickly, and there will be a point at which losses are incurred – the 'break-back' point. Beyond this, variable costs increase at a faster rate than revenues.

[27] Devenish, 2022, ibid.
[28] Clark, C. and Scanlon, B. (2019) Less is more: improving profitability and the natural environment in hill and other marginal farming systems Report for the RSPB, National Trust and the Wildlife Trusts. https://tinyurl.com/2p9efkv3. Further information from: https://www.nethergillassociates.co.uk/.

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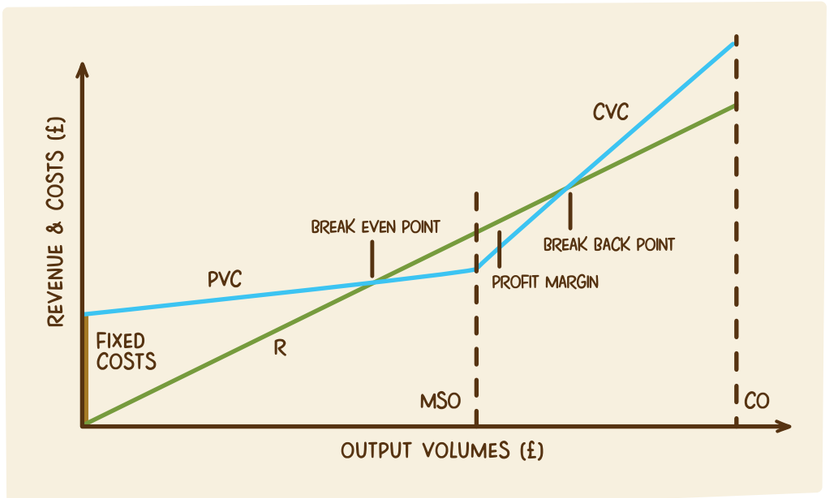


CO
Current Output level

CVC
Corrective Variable Costs

FC
Fixed Costs

MSO
Maximum Sustainable Output

PVC
Productive Variable Costs

R
Revenue without support

MSO terms

Break-back point: The point at which profit moves into loss, as costs – particularly variable costs, and especially CVCs – overtake income.

Break-even point: The sales required to cover the total costs, fixed and variable, except money drawn out of the business and capital expenditure, at a given level of production.

Capital expenditure: The money required to buy, upgrade and maintain physical elements of the business, e.g., buildings, equipment.

Costs:

- ***Fixed costs:*** Unavoidable costs on the farm, e.g., rent, rates, insurance, labour, machinery depreciation.

- ***Variable costs:*** Costs that are not fixed, and depend on the level of production and activity, e.g., fuel, seed, fertiliser, animal feed, contract labour. For the MSO calculation, these are further divided into:

  – Productive Variable Costs (PVCs):
  Unavoidable, essential costs of livestock production but where natural capital is being used within its limits, e.g., labour, essential veterinary expenses.

  – Corrective Variable Costs (CVCs):
  Avoidable, non-essential costs related to crop and livestock production, but which are needed to push production beyond what is feasible from the naturally available grass, e.g., brought in livestock feed, fertilisers, pesticides).

Maximum Sustainable Output: The point at which the natural assets of the farm are being maximally used without requiring additional inputs. In other words, where Productive Variable Costs turn into Corrective Variable Costs: the point of maximum profit.

Natural capital: The assets provided by nature and used by farmers for undertaking their business, e.g., soils, grass, water, geology.

Naturally available grass: The grass that grows without any artificial inputs. This allows for manure from the grazing livestock, but not additions such as artificial fertilisers.

MSO in Action

In practice, as MSO leads to cutting out fertiliser and bought-in feed, and – at least initially – the potential of less grass, a reduction in stocking levels is often required. An associated *decrease in revenue* usually occurs. However, this is counteracted by *savings* made from not buying in inputs and the results are *increased profits*.

This may be familiar to some readers, as Hybu Cig Cymru / Meat Promotion Wales' Red Meat Benchmarking report also challenges the idea that farm outputs can continue to increase profitably. It shows that the ability to keep costs down is universal among the top third financially performing enterprises. These businesses have much lower variable and overhead costs than both the average and lower performing enterprises. This is true for all farm types, and Hybu Cig Cymru / Meat Promotion Wales recommend that farm businesses fully evaluate their finances carefully before deciding to increase the size of their flocks or suckler cow herds[29].

Key MSO lessons

- **Corrective Variable Costs are major costs in Welsh agriculture:**
  - feed costs are the largest single contributor to farm expenses (almost 35% of all input costs in 2021 according to provisional figures),
  - "other farming costs" (which include pesticides, seeds, utilities, insurance, rates, banking fees and other general costs) are second,
  - "machinery costs" (of which just under a quarter are for fuel and oil) are third, and
  - "fertilisers and lime" fourth[30].
- Unlike most manufacturing, variable costs are not linear on farms: there is a point at which PVCs turn into CVCs, e.g., when naturally available grass runs out and feed must be bought in, or fertiliser applied to land. This is the MSO point. Work by Nethergill Associates in Wales found that farms incurred costs of between £2.15 and £13.63 for each £ increase in revenue beyond MSO[31]. Therefore, it is worth investigating expenses periodically to ensure that costs are reasonable and worthwhile.

Nethergill Associates' analysis suggested that implementing MSO across the farms in the study would result in an average revenue decrease of 12%. However, this would be more than offset by an average increase in profitability of 42%[32]. This is because of a greater focus on margins rather than maximising output volume.

[29] Redman, G. and Jerman, K. (2019) Red meat benchmarking project – driven by data Hybu Cig Cymru / Meat Promotion Wales: Aberystwyth. https://tinyurl.com/yckux6dh.
[30] Statistics for Wales, 2022, Aggregate agricultural output and income, 2021 https://tinyurl.com/2p962kpm; Specific fuel and oil figures: Statistics for Wales Average farm cost headings by farm type [online spreadsheet] https://statswales.gov.wales/v/Msgv
[31] Nethergill Associates (2023) Sustainable farming in Wales: engaging nature for business. https://www.nethergillassociates.co.uk/Portals/0/Wales%20MSO%20Technical%20Report NA.pdf
[32] Nethergill Associates (2023) ibid.
[33] Nethergill Associates (2023) ibid.

NATURE MEANS BUSINESS

In summary, MSO can be a helpful approach in changing the way farmers think about their business finances while contributing to nature recovery. It is an economic method used in conjunction with other tools, including nature-friendly farming practices, and an ethos that recognises and values the environment and its wildlife.

- Fixed costs must also be reduced. Almost none of the farms studied were profitable when fixed costs exceeded 40% of pre-support revenue[33].
- Make nature a central partner in the farm business: the natural resources of the farm are the basis of genuinely sustainable agricultural production.
- The MSO point can vary from year to year. Growing conditions change, affecting the availability of naturally available grass, and prices and costs increase or decrease. The MSO point generally increases over time as natural processes develop and achieve balance. See Hywel Morgan's case study for an example of this.
- An MSO assessment will not automatically make the farm profitable, but it will identify potential areas that can be improved to relieve the pressure on out-goings.
- Many farms will still need to look at other ways of reducing costs and making efficiencies – such as co-operating with neighbours to reduce grazing pressure on their own land while providing grazing services to others, or sharing machinery or equipment – or adding to their income, perhaps by developing premium-priced products, direct selling, or through environmental payments. Governments can enable farmers to do this.
- Changing the whole farm system and completely eliminating CVCs overnight can be overwhelming and difficult, therefore we would encourage a transitional approach, over three to five years, to reducing reliance on inputs. An alternative approach is to introduce changes to a designated area of the farm, so that lessons are learned and experience gained.

NATURE MEANS BUSINESS

In practice: **Improving financial resilience**

Hywel Morgan

Esgairllaethdy, Myddfai, Llandovery, Carmarthenshire

Hywel Morgan farms beef and sheep on 230 acres at the western end of the Bannau Brycheiniog National Park. The farm includes twenty acres of rented ground and fifty acres of conservation grazing, as well as grazing rights on the adjoining common land. Hywel sells some of the lamb and beef produced on the farm through farmers' markets.

What makes your farm nature-friendly?

I have cut out chemicals and fertiliser, and reduced bought-in feed. Hedges are allowed to grow taller and thicker, and only trimmed every three years. A large pond has been created. I have also planted a lot of trees and hedging over the last few years. I try to keep everything simple.

Why do you farm the way you do?

Why wouldn't I? Working with nature, not against it, is the only sensible way to farm. Financially, the cost of bought-in inputs has increased way past them being affordable.

Have you made changes to the livestock enterprise or cropping pattern?

I have reduced sheep and increased cattle numbers. The cattle are all native breeds, including Highland and Hereford-cross cows, put to a Shorthorn bull. The sheep are mainly native - Llandovery Whiteface ewes – with some Texel-crosses, that have been introduced to produce a lamb that can be sold sooner. I also do mob grazing and bale grazing.

Have you always farmed in this way, or have you been on a journey towards nature-friendly farming? How did you find this transition?

I changed the system five years ago after doing lots of cultivating and reseeding, with lots of fertilising: I realised that they were only short-term fixes and never really paid for the cost of the stress and inputs. The transition was challenging, both financially and mentally: the peer pressure to keep farming conventionally was huge and in the first year, we went from making seven bales / acre to four, although this improved after a couple of years, and we're now almost back to where we were before. Making the change has meant a large reduction in costs and I can see – and enjoy – the benefits of working with nature. Reducing or changing your livestock system doesn't make you any less of a farmer. If it makes economic sense and benefits the environment, then it's a no-brainer.

What support is needed to move to a regenerative / low or no input approach?

More farmer-to-farmer advice and support is needed. The banks should encourage and support this type of business, and accountants need to be realistic and explain to farmers the financial benefits of low input farming. Government policy should reward nature-friendly farming – it's a reward for doing good things that benefit all of us – and should ensure that smaller family farms benefit fairly, rather than bigger farms. Healthy nutritious food is part of the solution for the climate, environment and people's health, and we need supermarkets to support the transition too.

NATURE MEANS BUSINESS

In practice: **Diverse habitats for farm ecosystem health**

Peter Segger and Anne Evans
Blaencamel Farm, Cilcennin, Ceredigion

On 55 acres in the Aeron Valley, Peter Segger and Anne Evans have been producing organically certified vegetables, salads, fruit and flowers since the early 1970s. They sell at local farmers' markets, and Aberystwyth and Haverfordwest Food Hubs.

How would you define nature-friendly farming?

Intervening as little as possible, certainly doing no harm, and encouraging the health of all forms of life from the bottom to the top of the chain – with a principal focus on soil.

What makes your farm nature-friendly?

We have only ever followed organic farming practices and, in short, have tried to encourage nature in as many manifestations as possible, so that the whole unit is included and not an island approach. We have created ponds, developed rotations and left a few areas to their own devices. To suit some birds, like our bullfinches, we have planted perennials with dense seedheads, have ground cover over winter to offer wild plant seeds and protect the soils. We have larger scale thermophilic composting, manage woodlands to ensure equal numbers of mature, medium aged and young trees (woodland edge) to suit all woodland birds, and treat hedges as part of the rotation: cutting them by chainsaw every seven years, and the chip then forms part of the compost feedstock where the carbon is largely retained.

Why do you farm the way you do?

We hope it delivers a burgeoning form of nature, of a density and diversity to gladden the heart. It produces crops year after year which are full of flavour, as healthy in terms of vitamins, minerals and proteins as it is possible to find, and it has been – and is – a wonderful way of living for our family.

What are the environmental benefits?

Some benefits are, of course, personal and some are global. We have been measuring our carbon footprint for over 14 years and shown the benefits of our system. We have planted trees almost every year, and counted the species of birds (55 to date) and wildflowers (256).

What are the economic benefits?

The economic benefits are clear, but it took time to develop a profitable system. There was no official funding for horticultural growers then, and we had to pay hefty fees to be certified as organic and bore the travel costs when travelling around Europe to learn techniques otherwise unavailable. But now things have changed – and for the better.

What does your approach to farming mean for food security?

We probably can't quite produce all the food needed this way, but we can go a long way to counter the errors of the past – and feel a sense of pride – if we can change our diet: support local foods, less and better meat, more fresh produce and pulses and cereals, and more cooking from scratch. This surely is the only way forward if we want to look after ourselves, our land and our health.

NATURE MEANS BUSINESS

Huw Foulkes
Fferm Pentrefelin, Llandyrnog, Denbigh

In practice: **Plant diversity, reduced costs and healthy livestock**

With his herd of entirely pasture-fed dual-purpose Red Poll cattle, Huw Foulkes takes a regenerative approach to dairy farming. In this cow and calf system, the calves remain with their mothers until they are naturally weaned, the cows being milked once a day.

What makes your farm nature-friendly?

Our first big move was to go completely organic and eliminate the use of fertilisers and chemical sprays. We now introduce nitrogen fixing legumes, such as lucerne and clovers, into our pastures. We have found that these condition the soil extremely well and can transform its structure in three to four years. Our grazing management has also changed drastically. We rotationally graze the cattle onto fresh grass every single day, sometimes twice a day and also mob graze. The taller grass growth not only provides food for our cows, but also provides a home for wildlife. Sixty days between grazing periods means that many species in our pastures have time to flower and seed during the warmer months. These tempt pollinators back to the farm.

The introduction of trees onto the farm, and in particular our silvopasture trial, has also helped us be more nature-friendly. Two years ago, we took a field out of maize production and planted five rows of trees down the middle. In-between the rows, we direct drilled a grass and clover mix, on which we now graze cattle. This trial has made it clear to us that we can plant trees on the farm and see the benefits they bring to biodiversity, etc., but we can also still graze ruminants between these trees.

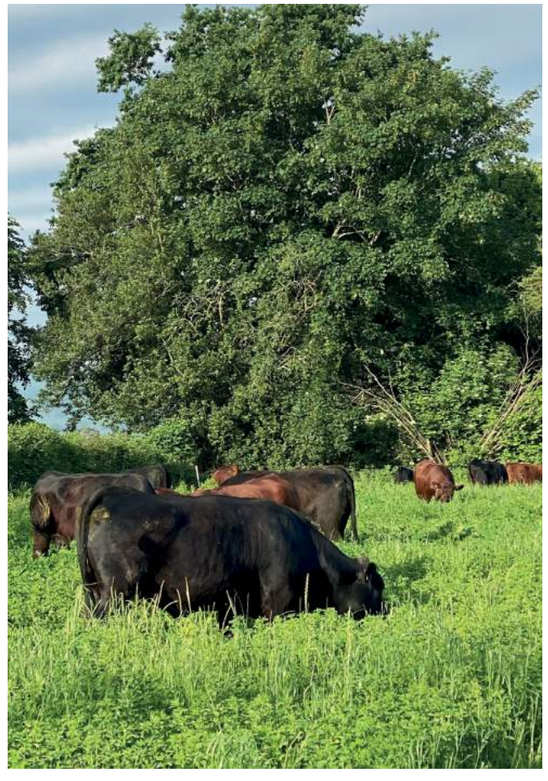
Have you made changes to the livestock enterprise?

The type of cow you will find on our dairy farm is very different to what you will find on a modern dairy farm. We keep dual purpose, heritage breed cows that were bred by our forefathers to thrive on diverse, low-quality pasture. These animals require very little maintenance, and produce nutritious beef and milk from very little input. They might take longer to finish, and won't produce as much milk as a modern cow, but they don't require the intensive diets involved in today's farming. We plan to only keep thirty or so breeding cows, so that we have enough land to keep them out for longer during the winter, reducing our winter housing costs and environmental impact.

What support do you need from the Welsh Government to continue farming in nature-friendly ways?

We need farmers that produce nutrient dense, healthy, nature-friendly food to be rewarded for their work. It doesn't make sense that 90% of the area in Wales is farmland, yet some parts of Wales are amongst the poorest in Europe and people can't afford to eat. The current food system does not work for farmers or the people in our country: it's not a secure food system and is one that's heavily reliant on factors that we can't control.

The Welsh Government needs to realise the benefits that nature-friendly farming will have for the environment, our health and food security, and help us educate consumers on these benefits. I think that investing in encouraging regenerative, nature-friendly farming will see an improvement in the overall health of the people in our country, as well as making our farmers less reliant on direct income support.



NATURE MEANS BUSINESS

In practice:
A whole farm approach

Polly Davies and Graeme Wilson

Slade Farm, St Bride's Major, Vale of Glamorgan

Polly Davies and Graeme Wilson are the third generation to farm this organic mixed farm. They produce award-winning meat boxes with lamb, beef and pork, as well as vegetables and flour, which they sell directly to customers on a delivery round, from the farm and through their own shop in St Bride's Major.

How would you define nature-friendly farming?

Creating farming practices that respect and work with nature's habitats.

What are the environmental benefits?

They are shown in the level of biodiversity that exists on the farm: the number of birds and the variety of species are significantly higher than comparable conventional systems. We maintain a number of arable species (weeds!) that are absent and becoming threatened elsewhere, and the organic matter in the soil is comparably higher than with other systems. We have created habitats that mean an abundance of life – and variety within that abundance. There is nothing better than watching leverets running in the stubbles. can also still graze ruminants between these trees.

Have you made changes to the livestock enterprise or cropping pattern?

We have always stocked at a relatively low density. This is important as we need the land to produce all of the food that we need for the livestock: we feel that providing homegrown forage and feed is the only way for a farm to work as a sustainable enterprise.

Would you encourage your peers and fellow farmers to embrace a regenerative approach?

We wouldn't want to farm any other way. Farming with bagged nitrogen, herbicides, pesticides is not something that we would entertain. There are many benefits to the environment – and your own place in the process of farming in a nature-friendly way – that are rewarding. What we can't say is that it will be more financially rewarding: that is dependent on whether the policy makers and the public are willing to pay for the environmental benefits, and that is something that is still being tested.

What does your approach to farming mean for food security?

It is sufficient to feed a proportion of the population. There is a great deal of land surrounding the farm that is used for feeding biodigesters, rather than producing food – our version of farming is certainly a better way of feeding a population compared to that.

What support do you need from the Welsh Government to continue farming in nature-friendly ways?

Like all businesses, we need some certainty in order to make and maintain the investments that the business needs to thrive. Although the direction that Welsh Government is taking on environmental contracts is generally positive, rolling contracts mean that year on year we see a reduction in the value of payments in real terms. Welsh Government also needs to ensure that it works with tenant farmers and others to ensure that they can all access new schemes. Public goods need to be paid for. If they are not financed by the public, overstretched farming families may not be able to afford to provide them.

NATURE MEANS BUSINESS

In practice: **Approaches for carbon management**

Rhodri Lloyd-Williams

Moelgolomen Farm, Talybont, Ceredigion

Rhodri Lloyd-Williams farms this upland, organic farm with his wife and parents, where they produce Welsh Black beef and Welsh Mountain lamb and mutton. Rhodri recently did an MSO assessment.

What makes your farm nature-friendly?

We try and create a mosaic of habitats, without reducing our agricultural output. We do rotational grazing, we've planted upwards of 80,000 trees in the last couple of decades and we're looking to double that. With the Woodland Trust, we're planting 10,000 a year. We've been organic since 1999, so there are no fertilisers or pesticides. We haven't ploughed for three years – I'm not saying that we'll never plough again, but we're trying to reduce tillage.

What are the environmental benefits?

It's great for biodiversity and nature – there are more, different habitats for nature to thrive in, and more carbon sequestration. We did a carbon audit recently and we're carbon negative – we're apparently sequestering more carbon than we're producing. With the climate changing, I think hedgerows are becoming more and more important as shelter for the stock. Hopefully, by having high hedges round every field, we're creating shelter for the stock from the hot sun in the summer and, in the winter, from the driving wind and rain and snow.

In 2012, the nearest village flooded badly, and flood mitigation is on our minds. I don't know how much one farm can do, but the people who were flooded have been coming up doing two days a week of tree planting, which has become a community thing. It's been great building bridges between the local community and the farm.

Why do you farm the way you do?

Instinctively, it feels like the right thing to do. There is an onus on us to make sure we farm in a way that is least damaging to the environment, and I do think that it is better for the environment, it's better for climate change, it's better for biodiversity, it's better for the stock because I think you can have healthier stock by doing it this way, and also in theory it should be better for the bank balance. There are lots of benefits if we do it right, but we are still learning.

What does your approach to farming mean for food security?

This is a really important point that sometimes gets forgotten because if we massively reduce the output from Welsh hill farms, the reality is that food has to come from somewhere, and more often than not it's imported. Meat is coming from South America where rainforest is getting cleared, so I would argue that that is a net decline in biodiversity globally, as well as having a massive impact on the climate potentially, with deforestation and the importation of meat. So, I'm trying to make all these changes while maintaining or even increasing our output. Every farm is different, and we're still tinkering with our system.

In practice: **Natural flood management**

Sam Kenyon

Glanllyn Farm, St Asaph, Denbighshire

A relative newcomer to farming in her own right, Sam Kenyon owns a very diverse farm, keeping sheep, goats, chickens and bees, as well as a horticulture enterprise. Eggs, meat, honey and vegetables are sold through a box scheme.

How would you define nature-friendly farming?

For me, it's treating nature as a partner that we want in our farm life and business – considering nature and the environment in every decision and action on our farm.

What makes your farm nature-friendly?

Rotational mob grazing during the growing season, with holistic grazing during the winter. We then test the soil for organic matter and do visual inspections for plant root depth, soil quality and critters. Natural flood management and riverbank repairs are vital, and also creating habitats and allow regeneration. We have a closed loop system use of farmyard manure and don't have a need for chemical inputs. We also undertake woodland management, and hedge-laying in winter. Extra bird and bat boxes are put up most years.

Have you always farmed in this way, or have you been on a journey towards nature-friendly farming? How did you find this transition?

I've only been farming for six years; it's definitely a journey and I wouldn't do it any other way. I wouldn't want to get reliant on expensive inputs that I've found I don't actually need. It isn't an easy way to farm when your neighbours all farm conventionally. Sometimes I doubt myself, but then I compare how much grass I have in a drought, because of resting areas through the mob grazing earlier in the season and using deep rooting leys, and I get encouraging comments from other farmers who can't believe how green the place looks during the driest summer on record. It wouldn't do my mental health any good to let nature and the farm degenerate. It helps my head to be regenerating the land and bringing extra quality to our produce, as well as giving more nature a home, and a role within my farm's landscape.

What are the challenges of moving to a regenerative / low or no input approach? What helped you?

The most important, and sometimes hardest, thing for me to engage with was the mindset and determination needed. Learning from, and accepting that I'd make plenty of mistakes was so important. Many mistakes made jobs harder than they needed to be, but that's how I learnt to make things easier in the long run. I've had to accept that inputs now come in the form of electric fencing, aeration and vaccinations, rather than continuously top-dressing land or dosing livestock – the stock are so much healthier for it.

Support from other nature-friendly farmers has been huge to me. And listening to regenerative farming podcasts has helped me to soak up knowledge quietly while I work. It feels good to be on the journey, even if making small steps. Recognising that we don't all need to be competing at the top of our farming game has helped; it's good to be making a positive difference, even if it's smaller than we want sometimes.

NATURE MEANS BUSINESS

In practice: **Building fertility and diversity**

Becky and Patrick Holden

Bwlchwernen Fawr, Lampeter, Ceredigion

Becky and Patrick Holden own this 300-acre dairy farm and produce Hafod cheese from their Ayrshire herd. The farm has been certified organic since 1973. Patrick is also Founder and CEO of the Sustainable Food Trust.

How would you define nature-friendly farming?

We believe it's what we've been doing for fifty years! Farming in harmony with nature, avoiding the use of chemical inputs and limiting the number of livestock to the capacity of the land that we farm to support them. For us, the crucial issue is that biodiversity can coexist with food production in the middle of the fields and across the whole farm, not just in the margins.

What makes your farm nature-friendly?

The key factor which makes our farm relatively nature-friendly is the non-use of nitrogen fertiliser. Because of this, unsown plants, or weeds as other people like to call them, can grow in the cropped habitat as well as the grassland. Our so-called regenerative farming practices include a seven-year rotation, building fertility with a herbal lay followed by two crops of oats and peas. The combination of 50% permanent pasture and 50% of a crop rotation provides an in-field habitat for a diversity of invertebrates, insects, plants, small mammals and birds, all of which coexist with the farming system.

Why do you farm the way you do?

It's always been a matter of conviction for us to avoid extractive and exploitative farming systems. We were in at the beginning of the development of organic standards, which were developed largely for economic reasons, to enable financial viability in an environment where the polluter pays, and the subsidies were misdirected. This is still the case, so there has to be an element of philosophical conviction because financially it's still pretty marginal.

Intensifying our farming operation might give us some short term profitability, however we would never consider it - fifty years of farming in harmony with nature and with minimal external inputs has built a healthy ecosystem with a resilience to external shocks.

What are the challenges of moving to a regenerative/ low or no input approach? What helped you?

We have learnt from practice and from other farmers and growers. We believe this is the best way forward as well - a national network of beacon farms. Additional barriers to change include financing capital investments, the absence of the availability of and the misdirection of agri-environment payments. There is still a silo-ed approach between food production and nature, although this is now beginning to change, which is great.

Would you encourage your peers and fellow farmers to embrace a regenerative approach?

If we wish to address climate change and restore nature, a switch to proper regenerative farming is the only way forward. But in terms of advice, anyone who transitions needs to realise that economically it is still a major challenge. Unlocking this barrier through a package of measures to finance the agricultural transition is a major feature of my day job with the Sustainable Food Trust right now.

Recommendations

For farmers

- Include nature as a partner in the farm business by incorporating it in every decision, and ensuring that the health of the soil, water, habitats and species are actively promoted, for instance by introducing regenerative farming techniques.
- Explore the practical actions you could take to make the farm more nature- and climate-friendly. Perhaps you could seek help to carry out a whole farm environmental habitat assessment and action plan. The NFFN report, Farming for Climate Action: What are we waiting for?, includes a table of practical actions to reduce your farm's effect on the climate, along with a blank table for you to detail which activities you will undertake.
- Consider undertaking an MSO assessment. Look at your costs and whether there is potential for reducing them, making efficiencies or adding sources of income.
- Get help and support from those who are already farming with nature: contact the Nature Friendly Farming Network, FWAG, Agricology or others in the Further Reading and Resources.
- Challenge the current system. Over the last century, policies, markets, education and advice have all encouraged farmers to intensify, specialise and chase yields can at the expense of nature. This doesn't necessarily make financial sense and is environmentally damaging. Look out for campaigns to effect change – and, in the process, support nature-friendly, profitable farming.

For the public

- Support farmers and growers who are doing the right thing for nature – not just food products, but also fibre, timber, homeware and gifts that are produced from the land.
- Buy from vegetable and meat box schemes from local farmers, local butchers, farm shops and farmers' markets, from producers who are helping nature. Eat better quality meat sourced from nature-friendly farmers, even if it means buying less of it.
- Eat fruit and vegetables in season, particularly if grown locally and by nature-friendly growers.
- With all these products, look out for certification schemes that promote nature-friendly practices. These include organic, pasture-fed for meat, or FSC certified for wood products.
- Reduce waste, not just food, but in all areas – it will avoid wasting the scarce resources that went into producing the item and also save you money.
- Talk to the farmers, growers and craftspeople you meet on market stalls and in farm shops and find out more about nature-friendly farming.

For policymakers

Upscale nature friendly farming - by supporting policies that encourage and reward specific nature friendly practices and approaches.

Build diversity - by implementing policies that encourage nature-friendly mixed farming, agroforestry, horticulture and new entrants into the sector in order to diversify the range of crops and produce grown and boost biodiversity and food security.

Help farmers adapt - by ensuring that farm advice supports a transition to regenerative agriculture, considering the farm business as a whole

Provide coherence - by ensuring that policies link the whole food chain. For example, by investing in local supply chains and infrastructure, work to ensure that small abattoirs and butchers' shops are protected. This will support local supply chains, which in turn will reduce carbon intensive activities, such as unnecessary transportation, and encourage greater awareness of food sovereignty. This will allow a more balanced marketplace for smaller suppliers, which can include nature-friendly farmers. These elements are also essential for food security.

Support an equitable/fair transition – by ensuring that tenant farmers can benefit from future schemes, allowing them the confidence and flexibility to farm in nature-friendly ways and use appropriate innovations, such as developing agroforestry systems.

Provide confidence and certainty - by committing to longer term support for those wishing to plan and undertake nature-friendly farming actions. These recommendations will help agricultural policy to comply with the requirements of the Wellbeing of Future Generations (Wales) Act 2015.

Safeguard Welsh farming - by putting pressure on the UK Government to commit to high food, environmental and animal welfare standards for trade deals to ensure that Welsh farmers are not undercut by imported food produced to lower standards and to protect the public from products which do not meet our own high standards.

Further Reading and Resources

Nature Friendly Farming Network publications

Nature Friendly Farming Network: www.nffn.org.uk

Rethink Food: A Plan for Action (2022). https://www.nffn.org.uk/wp-content/uploads/2022/10/nffn_report_final.pdf

Rethink Food: A Plan for Action. Key Policy Asks for Wales (2022). https://www.nffn.org.uk/wp-content/uploads/2022/10/nffn_Wales.pdf

A Practical Guide to Climate Action (2022). https://www.nffn.org.uk/wp-content/uploads/2023/02/NFFN-A-Practical-Guide-to-Climate-Action-For-UK-Farming-Booklet.pdf

Farming for Climate Action: What are we waiting for? (2022). https://www.nffn.org.uk/wp-content/uploads/2023/02/NFFN-Farming-For-Climate-Action-Report_Digital.pdf

Farming for Climate Action: Whole-farm infographic (2022). https://www.nffn.org.uk/wp-content/uploads/2022/01/NFFN-Farm-layout-DIGITAL.pdf

Rethink Farming: A practical guide for farming, nature & climate (2021) nffn.org.uk/wp-content/uploads/2023/02/NFFN-Rethink-Farming-Report_Digital-Final-Release.pdf

Nature Means Business: Establishing the balance between food production and improving nature (2020). https://www.nffn.org.uk/wp-content/uploads/2020/10/20012-NFFN-Report-Nature-means-business-DIGITAL-1.pdf

Regenerative farming

Regenerative Food and Farming website: https://regenerativefoodandfarming.co.uk/

Regen Ben website: https://www.regenben.com/regenerative-agriculture/

There are many books and podcasts available - search for regenerative farming or regenerative agriculture.

Actions for wildlife

Farm Wildlife https://farmwildlife.info/ (practical advice for helping wildlife on your farm, including several types of farmland habitat)

Hedgelink (no date) The complete hedge good management guide https://hedgelink.org.uk/about-us/

Stiles, W. (no date) The benefits of hedgerows and trees for agriculture Farming Connect https://businesswales.gov.wales/farmingconnect/news-and-events/technical-articles/benefits-hedgerows-and-trees-agriculture

Woodland Trust Agroforestry in Wales https://www.woodlandtrust.org.uk/protecting-trees-and-woods/campaign-with-us/agroforestry-in-wales/ (introducing the Hedges and Edges scheme).

Raskin, B. and Osborn, S. (Eds.) (2019) The agroforestry handbook: agroforestry for the UK 1st

Edition Soil Association https://www.soilassociation.org/media/19141/the-agroforestry-handbook.pdf

Woodland Trust and Ancient Tree Forum (2021) Ancient and veteran trees: caring for special trees on farms https://www.woodlandtrust.org.uk/media/50305/ancient-and-veteran-trees-caring-for-special-trees-on-farms.pdf

Plantlife Maintaining meadows https://meadows.plantlife.org.uk/3-maintaining-meadows/ (includes principles of good meadow management, managing meadows with livestock and mowing).

Farm Wildlife Permanent ponds https://farmwildlife.info/how-to-do-it-5/wet-features/permanent-ponds/#:~:text=Permanent%20ponds%20hold%20water%20all,many%20occasional%20or%20periodic%20visitors.

Freshwater Habitats Trust Pond creation toolkit https://freshwaterhabitats.org.uk/projects/million-ponds/pond-creation-toolkit/

Maximum Sustainable Output (MSO)

Clark, C. and Scanlon, B. (2019) Less is more: improving profitability and the natural environment in hill and other marginal farming systems RSPB,

National Trust and The Wildlife Trusts. https://www.wildlifetrusts.org/sites/default/files/2019-11/Hill%20farm%20profitability%20report%20-%20FINAL%20agreed%2015%20Nov%2019.pdf

Nethergill Associates: https://www.nethergillassociates.co.uk/

Other sources of interest

Championing the Farmed Environment https://www.cfeonline.org.uk/ (practical advice on good environmental management on productive farms in England)

Cuttress, D. (2022) Land sparing and land sharing – considerations for farming with nature Farming Connect https://businesswales.gov.wales/farmingconnect/news-and-events/technical-articles/land-sparing-and-land-sharing-considerations-farming-nature (discussion about the benefits and issues related to these different ways of balancing nature and agriculture)

Farming Connect: https://businesswales.gov.wales/farmingconnect/

Ontl, T.A. and Schulte, L.A. (2012) "Soil Carbon Storage" Nature Education Knowledge 3 (10): 35. https://www.nature.com/scitable/knowledge/library/soil-carbon-storage-84223790/ (good explanation of soil organic carbon and how sequestration works)

Organic Farmers & Growers: https://ofgorganic.org/ (organic certification body)

Organic Research Centre: https://www.organicresearchcentre.com/ (UK organic research charity), which includes:

Agricology: https://www.agricology.co.uk/ (platform sharing research and practice in all production systems including organic and regenerative)

Pasture for Life: https://www.pastureforlife.org/ (promoting and certifying pasture-fed livestock)

Regeneration International: https://regenerationinternational.org/ (international perspective on regenerative agriculture)

Rodale Institute: https://rodaleinstitute.org/ (organic research in the US)

Sustainable Food Trust: https://sustainablefoodtrust.org/ (looking at the whole food and farming chain in the UK)

Soil Association https://www.soilassociation.org/farmers-growers/ (organic certification body) including:

- Information about soil health: https://www.soilassociation.org/farmers-growers/technicalinformation/soil-health/
- Information about agroforestry: https://www.soilassociation.org/causes-campaigns/agroforestry/
- Innovative Farmers scheme https://innovativefarmers.org/ (for farmer-led research projects)

Acknowledgements

Key ideas on page 6 come from the NFFN (2022) publication, Rethink Food: A plan for action, while the MSO information on pages 16-17 was drawn from Clark and Scanlon's Less is More (2019) report and the NFFN (2020) publication, Nature Means Business: establishing the balance between food production and improving nature.

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