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Do England's new Environmental Land Management support schemes meet the requirements for regenerative farmers?

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ABSTRACT

The United Kingdom's departure from the European Union has led to a revision of its agricultural and environmental policies. For England, a new system of support payments to farmers is the Environmental Land Management Scheme. Concurrently, regenerative agriculture is gaining traction as a farming system in England to produce food alongside sustained environmental improvements. This paper examines the policy process and development of new English schemes, specifically the Sustainable Farming Incentive and the revised Countryside Stewardship; in turn, followed by a review of regenerative agriculture identifying its core principles. An innovative qualitative scoring system is developed to map the aims and actions of the new schemes, as introduced at the end of 2023, against these core principles for regenerative farming. The scoring system offers a policy tool for aligning regenerative principles with current and future iterations of agri-environmental support schemes. The results of the scoring system find that the new schemes meet the principles of regenerative farming, with the marked exception of the integration of livestock into the production system. The English schemes will need to address the role of livestock in regenerative farming systems as regenerative farming principles gain more popularity, following the more recent example of Scotland.

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Introduction

Regenerative agriculture, embracing a set of core principles and intended outcomes, is being advocated and adopted by farmers in England. Concurrently, the UK government, with application to England, is adopting new systems of payments and supports its farmers for the delivery of public goods from their land stewardship and farming practices. The aim of this study is to assess the extent to which the new payment schemes in England align with the principles and intended outcomes of Regenerative Agriculture. In January 2023, after nearly 4 years of consultation and pilot schemes, the Department for Environment and Food and Rural Affairs (DEFRA) published the first details of actions and payments for the new Environmental Land Management Schemes (ELMs), outlining how English post-Brexit agricultural policy payments to farmers would operate. The three schemes available are the Sustainable Farming Incentive (SFI), Countryside Stewardship Scheme (CS) and Landscape Recovery (LR). The SFI will pay farmers to adopt and maintain sustainable farming practices that can protect and enhance the natural environment alongside food production and support farm productivity, including by improving animal health and welfare, optimizing the use of inputs and making better use of natural resources. CS will pay for more targeted actions related to specific locations, features and habitats. LR will pay for bespoke, large and long-term projects involving collaboration by a number of farm businesses. By June 2023, there were about 40,000 agreements for the various schemes covering about 34% of agricultural land in England with DEFRA aiming to increase this to at least 70,000 agreements covering 70% of farmed land and 70% of farms by 2028 (HM Government, 2023a) with a further 11,000 applications for the SFI by the end of February 2024 (National Farmers Union, NFU, 2024a).

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Evidence of the long-term adverse impacts of modern farming methods upon soil degradation, and water availability and quantity, and loss of wildlife and biodiversity has generated plans to address these problems at a global intergovernmental level (e.g. Convention on Biodiversity, 2023; FAO, 2017; FAO-GSP, 2023a, 2023b; United Nations, 2022). In the UK, DEFRA responded to such damage with a national soil strategy (DEFRA, 2009), with the condition of agricultural soil and water quality seen as intrinsically linked (Agriculture and Horticulture Development Board, 2023; DEFRA, 2009; Parikh & James, 2012). The soils of the UK face three main threats: first, erosion by wind and rain affects both the productivity of soils and water quality and aquatic ecosystems; second, soil compaction reduces agricultural productivity (Environment Agency, 2019) and finally, water infiltration and increased flood risk through higher levels of runoff from land surfaces (DEFRA, 2009; DEFRA, 2018a). The annual UK State of Nature reports have highlighted that the UK was one of the most nature-depleted countries in the world and is still in decline (State of Nature Partnership, 2023). Since 1970, UK species have declined by approximately 19% on average, and nearly 1 in 6 species (16.1%) are now threatened with extinction, with 70% of UK land used for agriculture (HM Government, 2018c; State of Nature Partnership, 2023).

The core characteristics of regenerative agriculture and farming are identified in a review of international and national (UK) academic literature and practitioner statements, in turn focusing on England, identifying nine core principles for analysis applicable to the current national agricultural context. The development of the new ELMs payment schemes and their emerging key categories and actions are explained. The main principles of regenerative agriculture identified are: minimize soil disturbance, maximize species diversity, maximize crop diversity, keep the soil covered, build up soil organic matter, maintain living roots throughout the year, improve water infiltration, improve water quality and integrate livestock. A scoring system is developed and utilized for application to regenerative farming practitioners under various ELM payment headings (e.g. arable land, permanent crops and grassland). Further data are extrapolated from other defined payment areas not specific to farming practices, such as land boundaries, water bodies and woodlands, trees and agroforestry. These are all then 'mapped' against the nine desired outcomes identified, and they are scored according to their viability, suitability and implications for regenerative farming practitioners, who themselves, in turn, are entering or considering entry into the schemes. Finally, the implications of the findings are considered in the context of the current period of agricultural policy transition in England and, more widely, the UK.

Literature review

Regenerative agriculture principles and outcomes for UK farming

To date, there is a dearth of published academic research analyzing the content and impacts of the new ELMs. Evaluations of the ELMs have focused on the processes of their formulation and coproduction processes with farmers (Hurley et al 2022; Little et al 2024) and in relation to other natural capital farm business income sources (Dewalley et al 2025; Holt and Morris 2022). This research takes an initial step in providing an assessment of the alignment of the first wave of ELMs payments to the core principles and desired outcomes of regenerative agriculture in England.

Regenerative agriculture is becoming increasingly prominent in practice and policy debates in UK agriculture. In this section, we review the academic and practitioner literature and statements on what Regenerative Agriculture's main principles are and identify a set of core principles identified by practitioner and farming sector advisory bodies that are being applied to the UK farming context. As a starting point, regenerative agriculture can be characterized as essentially farmer-led movement and a body of thought, focusing on biology as opposed to chemistry (Brown, 2018).

Regenerative agriculture has been critiqued for its ambiguity as a guiding concept (Cusworth et al., 2022), and within the resurgence of interest in regenerative agriculture, there is a lack of consensus around any particular definition (Giller et al., 2021). Rodale (1983) proposed it as an option for more conventional agriculture, suggesting that it could lead to more sustainable production systems, an approach emphasizing the use of resources found on the farm rather than expensive imported energy resources, specifically chemical fertilizers and pesticides. These natural resources include nitrogen that can be biologically 'fixed' in the soil and soil organic matter. Francis et al. (1986) articulated this approach further forward suggesting that future agricultural systems

could be designed to maximize farm resources through increased nitrogen fixation, greater total organic matter, integrated pest management, genetic tolerance to pests and stress conditions and higher levels of biological activity, all of which contribute to greater resource efficiency. Rhodes (2017) noted that when referring to regenerative agriculture, the term regenerative fundamentally means bringing back into existence. Soloviev & Landua (2016) investigated the ambiguity of definitions, suggesting that Regenerative Agriculture could not be clearly defined, in contrast to Wilson et al. (2022), who claimed that there was more harmony than discord on definitions and practices among Regenerative Agriculture stakeholders. More recently, Schreefel et al. (2020) maintained that a variety of actors perceive regenerative agriculture differently and a clear scientific definition is lacking. Regeneration International (2017), an international nonprofit organization, summarized regenerative agriculture as: ‘farming and grazing practices that, among other benefits, reverse climate change by rebuilding soil organic matter and restoring degraded soil biodiversity—resulting in both carbon draw down and improving the water cycle’.

Regeneration International (2017) also stated that regenerative agriculture improves soil structure to reverse civilization-threatening human-caused soil loss. Similarly, Giller et al. (2021) suggested that with agriculture in crisis, regenerative agriculture is the answer to the global issue of soil degradation and loss. In a review paper, Schreefel et al. (2020) suggested that soil is the base, and any proposed scientific definition should start from this perspective. Newton et al. (2020), in a wide-ranging review of academic papers and practitioner websites, categorized these definitions into three groups: process-based definitions, outcome-based definitions and combined process and outcome definitions. The review saw process-based definitions as being focused on the inclusion or exclusion of one or more agricultural principles and/or practices such as minimum tillage, reduced fertilizer use and the integration of livestock. Outcome-based definitions are directly concerned with the results of regenerative agriculture, such as carbon sequestration or improved biodiversity (Giller et al., 2021).

In the UK context, there is a shared set of principles, albeit with some differences in emphasis and wording, among different practitioners of, and advisors on, regenerative agriculture and farming. Table 1 provides an overview of the most common voiced principles from a range of such bodies

Table 1. United Kingdom core principles for regenerative agriculture.

| | Core principal | Source |
|----|---|--|
| 1 | Understand the context of your farm operation | Knepp (2023) LEAF (2023) |
| 2 | Minimise soil disturbance | Savills (2021b) ¹ , Knepp (2023) Groundswell (2021) ² Game and wildlife conservation trust (2023) LEAF (2023) |
| 3 | Maximise species diversity | Savills (2021b) Game and wildlife conservation trust (2023) |
| 4 | Maximise crop diversity | Knepp (2023) Groundswell (2021) ² LEAF (2023) |
| 5 | Keep the soil covered | Savills (2021b), Knepp (2023) Groundswell (2021) ² Game and wildlife conservation trust (2023) LEAF (2023) |
| 6 | Build up soil organic matter | Savills (2021b) ¹ |
| 7 | Maintain living roots all year round | Savills (2021b), Knepp (2023) Groundswell (2021) ² Game and wildlife conservation trust (2023) LEAF (2023) |
| 8 | Improve water infiltration | Savills (2021b), Groundswell (2021), Game and wildlife conservation trust (2023), LEAF (2023) ⁵ |
| 9 | Improve water quality | Savills (2021b) ⁴ , LEAF (2023) ⁵ |
| 10 | Integrate livestock | Savills (2021b), Knepp (2023) Groundswell (2021) ² Game and wildlife conservation trust (2023) ³ LEAF (2023) |

Source: The Authors, from stated literature.

¹With the addition of ‘and build up organic matter’.

²Slightly different wording.

³With the addition of organic matter.

⁴As a consequence of reduced run-off and reduced chemical use.

⁵Water management and pollution control.

(Game and Wildlife Conservation Trust, 2023; Groundswell, 2021; Knepp, 2023; LEAF, 2023; Savills, 2021a). Savill's (2021b) analysis characterized industrialized agriculture as disconnected, extractive, controlling of nature with higher chemical inputs, monocultures and carbon emissions. Conversely, regenerative agriculture is depicted as interconnected, value added and working with nature with lower chemical inputs, diversity and carbon fixing. For the regenerative farming movement, conventional (industrial) agriculture is seen as a net taker from, and degrader of, the natural environment, whereas regenerative agriculture aims to work in harmony with nature. These sources suggest that the foremost focus is preservation of the soil, leading to improved water quality and retention through reduced inputs and crop/living root cover with livestock provides grazing and soil fertility support. This was confirmed to some extent by Jaworski et al. (2023), who reported moderate to high levels of awareness and up take of some sustainable soil management practices in a relatively young sample of UK farmers, showing that some, but not all, farmers are already combining regenerative practices in a way that contributes to all five principles of regenerative agriculture, aiming to restore soil health by reducing soil disturbance, maintaining soil cover and crop diversity and increasing soil organic matter (Beecham et al., 2023). Notably, Jaworski et al. (2023) adapted some of the 5 main core values for the sake of their farm survey, particularly the generally accepted principle of integrating livestock, which was expanded to: 'increase soil organic matter through the use of nonchemical fertilizers: using compost, slurry, digestate or manure, returning crop residue to the field, leys and mob/holistic grazing'. In effect, practices rather than outcomes.

Although the various proponents of regenerative agriculture agree over the basic principles, there are variations in their approaches. For example, Groundswell (2021) specifically states 'Don't disturb the soil', whereas Savills (2021b) mentions minimizing soil disturbance, and the Game and Wildlife Conservation Trust (2023) talks about reducing soil disturbance. All are in agreement for keeping the soil covered with slight differences in wording, for instance, the Game and Wildlife Conservation Trust (2023) refers to soil protection and Groundswell (2021), Savills (2021b) and LEAF (2023) just state 'keep soil covered'. The main differences occur with the integration of livestock. The Game and Wildlife Conservation Trust (2023) prefers the term 'integration of organic matter' or 'integration of organic manures preferably through grazing livestock'. LEAF (2023) and Savills (2021b) specifically state 'integrate livestock' and Groundswell (2021) talks about reintroducing livestock, possibly reflecting a primary focus on arable-based farming. Groundswell's use of the term 'reintroduces' may be applicable for conventional farmers considering a move towards regenerative techniques when examining the suitability of ELMs or the SFI for their own businesses.

The environmental and agricultural policy pathways to ELMs

The departure of the UK from the European Union (EU), termed Brexit, after the referendum vote to leave in 2016, led to the development of a new regulatory framework in preparation for leaving the European Union (EU) on 31 January 2020. Agricultural and environmental policies were two areas where much of the UK's legislation was derived from EU law. The EU's Common Agricultural Policy (CAP) provided legal bases for support to British farming, with 61% of UK farm income derived from direct CAP payments (HM Government, 2018a). The UK government's revision of agricultural policy was framed within the vision for its recast environment policy. The UK Government, from DEFRA, developed a vision and strategic direction to address the state of the environment (HM Government, 2017; 2018a), which outlined a commitment to address climate change and reduce emissions across all sectors of the economy, with intentions and actions to help the natural world regain and retain good health. The aims are to deliver cleaner air and water in cities and rural landscapes, protect threatened species and provide richer wildlife habitats. In turn, the strategy called for an approach to agriculture, forestry, land use and fishing that placed the environment first (HM Government, 2018b). The resultant and enabling Environment Act 2021 (HM Government, 2021a) was touted as being the world's leading legislation to protect and enhance the environment for future generations (HM Government, 2021b). The actions and targets to realise the original vision were set out in more detail in the Environmental Improvement Plan, which outlined a target of 65%–80% of landowners and farmers adopting nature-friendly farming on at least 10%–15% of their land by 2030 (DEFRA, 2023a).

Under the Common Agricultural Policy (CAP), in England, support to farmers is delivered largely through the Basic Payment Scheme (BPS), that made an annual direct payment to farmers each year based on the area of land they managed, and on their meeting key existing legislative standards and keeping their land in good agricultural and environmental condition (DEFRA, 2015). The CAP payments were based on the concept of farmers and agriculture as delivering public goods for society as a whole, such as landscape management, environmental management, food safety and animal welfare. The UK government adhered to this concept using the phrase ‘public money for public goods’ in its post-Brexit consultation document ‘Health and Harmony: the future for food, farming and the environment in a Green Brexit’ (DEFRA, 2018b). This document outlined the government’s intentions to move away from what it considered to be a ‘flawed’ CAP and head towards a more environmental protection strategy, including clean air, water, improved soil quality and improved biodiversity (DEFRA, 2018b). The revised powers for the Government over Agriculture in England were set out in the Agriculture Act of 2020 (Agriculture Act, 2020).

The revisions to the support schemes for farmers, in line with the provision of public goods, began a process of development, seeking co-production with farmers and other relevant actors, involving several refinements, some changes and tests and trials and pilot projects (DEFRA, 2020a; DEFRA, 2020b; Little et al., 2024) In the ‘Path to Sustainable Farming Agricultural Transition Plan 2021 to 2024’, DEFRA laid out its ambitions for policy reform as well as providing more detail on the timetable for this reform, stating that its aims for the farming sector by 2028 were ‘A renewed agricultural sector, producing healthy food for consumption at home and abroad, where farms can be profitable and economically sustainable without subsidy’ (DEFRA, 2020c).

The main body of supports comes through the ELMs composed of three tiers: the base-line SFI; a revamped Countryside Stewardship scheme (CS) promoting higher level forms of environmental management; and the wider LR stretching across neighbouring farms in specific ecosystem catchment areas. Landscape recovery is for long-term large-scale projects that support net-zero, protected sites and habitat creation (HM Government, 2023c). The first two tiers are individual farm-level applications, with the CS building upon the earlier versions of the Countryside Stewardship payment schemes. The more specific details of the schemes and the payment rates are being rolled out by DEFRA from 2023 onwards in an ongoing, iterative process.

In January 2023, details of the first of the ELM payment schemes were released (HM Government, 2023a), with the majority coming under the new enhanced version of the CS. DEFRA stated that the overall aim of the schemes was to pay farmers and land managers to deliver, alongside food production, significant and important outcomes for the climate and environment that can only be delivered by farmers and other land managers in the wider countryside. These include creating and restoring a broad range of wildlife-rich habitats, as well as continuing to protect habitats already managed under existing agri-environment schemes, alongside improving water quality by reducing nitrogen, phosphorus and sediment pollution from agricultural activities and increasing resilience to flooding. There are also payments for creating new woodlands and treescapes, including the management of existing woodlands and increasing their resilience to pests and diseases. (HM Government, 2023a). The next set of ELM proposals, released two months later, focused more on the SFI tier, paying farmers to adopt and maintain sustainable farming practices and supporting farm productivity by improving animal health and welfare, optimizing the use of inputs and making better use of natural resources (HM Government, 2023b). Under the SFI, DEFRA introduced six new standards for hedgerows, integrated pest management (IPM), nutrient management, arable and horticultural land, improved grassland and low-input grassland (HM Government, 2023b). Embedded within the SFI are also payments for completing a soil assessment and producing a soil management plan, testing and adding soil organic matter and having green cover on at least 70% of the land in the standard over winter (with 70% including 20% multi-species cover crops at the intermediate level). There are payments for new actions under the SFI on land used to grow permanent crops, such as for an adviser to visit to assess and recommend IPM plans, to review and improve nutrient use efficiency, along with schemes for establishing and maintaining in-field flower-rich strips to provide habitats for natural pest enemies and zero use of insecticides. DEFRA’s website pages for the payment schemes have a code for each CS and SFI category, as listed in Table 2, a payment rate and some information about whether or not the scheme will be updated, and there is also a link to ‘more information which in turn take the reader to further pages providing details about the scheme’ (HM Government, 2023a, 2023b).

Table 2. Countryside stewardship and sustainable farming categories.

| Countryside stewardship categories | Sustainable farming incentive categories |
|------------------------------------|--|
| Grassland | Soil Health |
| Arable Land | Moorlands |
| Permanent crops | Hedgerows |
| Moorland and upland peat | Integrated Pest management |
| Lowland peat | Nutrient management |
| Woodland, trees and agro-forestry | Farmland wildlife |
| Boundaries | Buffer strips |
| Water Bodies | Low input grassland |
| Species recovery and management | |
| Wetland habitats | |
| Coastal habitats | |
| Lowland heathland | |
| Annual health and welfare review | |
| Access and engagement | |
| Heritage | |

Source: The Authors adapted from HM Government (2023b), (2023c).

Materials and methods

In order to address the research question ‘Do England’s new Environmental Land Management support schemes meet the requirements for regenerative farmers?’ – the most basic approach would be a binary system of suitability (yes/no). However, because the DEFRA descriptors within the schemes are often open ended or lacking clarity in the text, a basic scoring system was applied. Assigning scores in qualitative research is well documented, for example, Hopgood (2023) refers to ‘wants’ and ‘needs’ for matching available options to user requirements. Hopgood (2023) explained that the needs must be satisfied, whereas wants are attributes to maximize. Eliminating options that fail to meet the needs is straightforward, but combining the wants is more complicated. This was the case when mapping the suitability of the options for regenerative farmers against the core values. Here, maximization was not possible, as no priority or level of importance was available within the regenerative literature.

The seven identified core principles were aligned with the ELMs (CS and SFI), along with the regenerative agriculture and environmental policy literature, to look for duplication and any ambiguity. Understanding the context of individual farm operations as a core principle was omitted, as it was felt that most farmers would fully understand this, specifically when discussing the various schemes with family, consultants and DEFRA advisors. There were also no items that specifically rewarded or incentivized for this. Indeed, the ELMs allow farmers to pick and choose the most suitable ones to adopt for their particular farm’s needs. Soil organic matter was added, as mentioned in the literature, often as an addition to another item (see Table 1). The consequential effects of some actions not specifically aimed at water issues, for instance maintaining cover crops over winter, will by default reduce the run-off of nutrients, therefore decreasing pollutants in watercourses by retaining the water beneath the plants and increasing water infiltration. The same actions that involve maintaining a cover crop will also minimize soil disturbance through a reduction in cultivation, increasing the levels of organic matter in the soil, again because run-off and therefore the loss of soil organic matter will be minimized. All these aspects are interlinked, and DEFRA’s desire to improve species diversity has created, perhaps inadvertently, a basis for increasing regenerative agricultural practices through the CS and SFI schemes.

A total of nine core principles were used in the analysis:

1. Minimize soil disturbance;
2. Maximize species diversity;
3. Maximize crop diversity;
4. Keep the soil covered;
5. Build up soil organic matter;
6. Maintain living roots throughout the year;
7. Improve water infiltration;
8. Improve water quality and
9. Integrate livestock.

The focus of this research is to ascertain if the actions put forward in the first waves of the CS and SFI meet the needs of regenerative farmers with respect to farming practice or potential changes to farming practice related to the core principles of regenerative agriculture. The boundaries for the analysis are current farming practice and/or changes in cropping or land use in order to enrol in one of the schemes

while continuing to farm in a regenerative style. As a result, specific actions exclusively for organic practitioners enrolled in CS were omitted. Countryside stewardship was already in place under the BPS and had therefore been amended and changed over the preceding years. The actions available under CS (see Table 2) are not mutually exclusive to each designated cropping or land type and, as such, are available under a number of headings; for example, AB1: establishing and maintaining a nectar flower mix is available for arable crops and permanent crop land. Upland and lowland moorlands, coastal regions, wetland habitats and lowland heathlands are all habitat specific and do not represent a 'typical' farm. In addition, there is the Animal Health and Welfare Review payment available to livestock producers as a contributory payment towards veterinary costs to undertake a health and welfare review of their livestock enterprises. Access and engagement and heritage issues are beyond the remit of this study and would not really result in a big change or amendment to a producer's current farming practice unless they specifically followed a public engagement route, such as becoming an open farm. Towards the end of 2023, DEFRA introduced the first SFI actions. In comparison to the CS, the SFI is a newly designed set of schemes with actions falling under one specific heading, for example soil health, hedgerows and so on. (see Table 2). As a result, all actions available apart from those related to moorland (a very specific land type that has to be managed as moorland) have been included. Notably, both the CS and the SFI are constantly being updated, so the text of the working documents is liable to change at short notice. The data utilized were correct to the end of 2023.

Over 1000 pages of ELM texts were scrutinized, and a score system was developed for the actions for arable land, permanent crops and intensive use grassland, which involved changes in farming practice and land use and were coupled with an area payment/incentive.

Organic schemes were omitted, as these schemes are specifically for those farmers who have, or are seeking, organic status along with other items that were not yet finalized at the time of writing. The items that were also omitted from the scoring system but considered in the analysis were consultancy or testing items such as completing a soil assessment and producing a soil management plan or testing for organic matter that received a one-off payment and/or annual payment. Items that had not yet been finalized at the time of analysis, including, for example, the addition of precision farming practices to the SFI, were also omitted SFI, were also omitted. The CSs included grassland ($n = 30$), arable land ($n = 27$) and permanent crops (such as fruit trees, grapevines, etc.) ($n = 9$). For the SFI, these categories included actions for soils ($n = 2$), integrated pest management ($n = 3$), nutrient management ($n = 2$), farmland wildlife on arable and horticultural land, ($n = 3$), farmland wildlife on improved grassland ($n = 3$), buffer strips ($n = 2$), farmland wildlife on improved grassland ($n = 2$) and low input grassland ($n = 2$). Alongside item codes, schemes (CS or SFI), columns were generated for the price received per ha, DEFRA descriptors and score allocated.

The scoring system is a measure of whether a particular action within a scheme meets any of the nine criteria for regenerative agriculture, the idea being to map the nine core values of regenerative agriculture against the DEFRA stated environmental outcomes in a qualitative way. A score of 1.0 was allocated if the policy literature DEFRA environmental descriptors state any of the regenerative core values. A further score of 0.5 was allocated if the specific action met other regenerative values as a consequential effect of the action. Given the novelty of the approach adopted validation of the scores assigned was difficult. Validation of scoring was conducted through an inter-related process whereby one author undertook the initial scoring, which was then verified by the second author leading to the score. This approach is based on the judgement of the scorers. The three examples presented below illustrate examples of how these scores were obtained. In comparison, there were very few discrepancies, which were resolved by discussion. Notably, the scoring system is designed only to ascertain whether the specific actions meet regenerative outcomes, and the allocated scores are not a measure of how well they will meet the desired DEFRA outcomes. Items from the ELM update (HM Government, 2023a) and the Sustainable Farming Handbook (HM Government, 2023b) were entered into Microsoft Excel™ for Mac 2011 (version 14.1.0) workbooks in the categories itemized by DEFRA (HM Government, 2023a, 2023b). The calculations were carried out using the basic mathematical addition and summation functions with SFI/CSS available options listed in rows (the wants) and the regenerative core values listed in columns (the needs). All the cells were annotated using 'pop up' text boxes, which provided brief descriptions for each SFI/CS option for ease of use. Mathematically, the calculation is expressed as follows:

$$\sum_{i=1}^9 x$$

where x = regenerative agriculture practices ($n = 9$) are assigned values of 0, 0.5 or 1.

The qualitative nature of the scoring system is acknowledged, and the Excel file in Appendix 1 can be accessed to allow readers to make their own judgements against those made in this paper. The three examples are given below (see Appendix 1).

Example 1

AB1: Establishing and maintaining a nectar flower mix payable at £614/ha (Eur704; \$817) under CS (HM Government, 2023d). This scheme involves replacing arable or permanent crops with a wildflower seed mix, the DEFRA environmental descriptor stating that 'It provides areas of flowering plants to boost essential food sources for beneficial pollinators such as bumble bees, solitary bees, butterflies and hoverflies'. Clearly this is to encourage species diversity and would therefore be allocated a score of 1.0 for that category. The consequential effects of this would then be allocated a score of 0.5 for minimizing soil disturbance, as it would no longer be subject to regular annual cultivation; it would also score 0.5 for maximizing crop diversity, as the crop can be grazed or conserved after the summer period and therefore a utilisable agricultural crop and would also score 0.5 for integrating livestock because of this factor. Furthermore, it would score 0.5 for keeping the soil covered throughout the year and therefore building up soil organic matter (0.5), maintaining living roots throughout the year (0.5) and improving water infiltration (0.5) and water quality (0.5) owing to reduced run-off from a permanent cover crop. This action would score a total of five from a possible nine.

Example 2

IPM4: No use of insecticide on arable and permanent crops payable at £45/ha (Eur52; \$60) under the IPM banner of the SFI (HM Government, 2023e). This entails zero use of insecticides; however, fertilizer and herbicides may still be used. The DEFRA environmental descriptor reads, 'This action's aim is that you do not use plant protection products containing insecticides. The purpose of this is to support an IPM approach by managing crop pests in a more sustainable way, improving water and air quality and increasing biodiversity'. In this case, a score of one was allocated for species diversity and improving water quality, with a total score of two. There are no other consequential effects as it is just cutting out one input in the arable system, and cultivation will still take place as normal.

Example 3

SW4: Creating and managing 12–24 m watercourse buffer strips on cultivated land payable at £612/ha (Eur701; \$815) under the CS (HM Government, 2023f). The DEFRA Environmental descriptor states, 'It establishes a grass buffer to help reduce the risk of potential pollutants, such as sediment, pesticides and nutrients (mainly phosphate), being transported to watercourses in surface water runoff. It may also provide habitat for wildlife, and form links between other habitats. Reducing the use of fertilisers close to sensitive habitats will help to reduce concentrations in atmospheric nitrogen and dry deposition at the habitat'. In this case, score allocation is one for maximizing species diversity (protecting and/or creating habitats) and one for both improving water infiltration and improving water quality by reducing run-off into watercourses. Furthermore, the consequential effects include minimizing soil disturbance (0.5), keeping the soil covered all year round (0.5), increasing soil organic matter (0.5) and maintaining living roots all year round (0.5), giving a total score of 5. This is very similar to Example 1, albeit on smaller parcels of land; however, in this case, livestock are prohibited from any access to the land.

In theory, all the maximum any action could score is 9.0; however, this is not always the case, as some actions are very specific, for example, SP9: Supplement for threatened species payable at £171/ha (Eur196;

\$228) (HM Government, 2023g), which is a supplementary payment if certain threatened species have been observed at the site, such as Turtle Dove, Stone Curlew or Corn Bunting, and is only available in areas of the country specific to those species. In this case, it is only possible to allocate a score of one. Grassland-based actions also present difficulties in scoring as grassland by its very nature minimizes soil disturbance, maintains soil cover and a living root system, consequently protecting water courses and maintaining water infiltration. It would also most certainly be the case that grass-based farms would also already keep livestock.

Results

Table 3 illustrates the allocated scores for the CS for arable land, permanent crops and grassland. The total action column for each category is the percentage of actions under each category in which a score has been allocated; for example, for arable land (Table 2), 70.4% of actions from a possible 27 will minimize soil disturbance. The next column is the number of score allocations of one as extrapolated from the DEFRA environmental descriptor followed by the number of scores allocated at 0.5 for consequential effects of the action followed by the total allocated score.

Table 4 illustrates the scores for all the actions under the banners for Actions for soils, IPM, nutrient management, farmland wildlife on arable and horticultural land, Farmland wildlife on improved grassland, buffer strips and low-input grassland. The N/A column is the number of grassland actions that are not applicable.

From Tables 3 and 4, it can be observed that maximizing species diversity generates the highest scores occurring in all 27 CS actions for arable land, with 25 being stated as DEFRA's intended outcome from the various actions. A similar pattern can be seen for permanent crops, with nine of the nine actions all scoring one. For grasslands, 21 from a possible 30 all scoring a value of one, with no score of 0.5. For the SFI actions, maximizing species diversity occurs in 15 of the 16 actions, with 13 of those being DEFRA's intended outcome (scoring one). For arable land soil-based regenerative values also score highly, with minimal soil disturbance (19 from 27 actions, zero scores of one), keeping the soil covered (19 from 27, one score of

Table 3. Scores for DEFRA actions under the countryside stewardship scheme.

| Items meeting regenerative agriculture outcome | Arable land (n = 27) | | | | Permanent crops (n = 9) | | | | Grassland (n = 30) | | | |
|--|----------------------|---------------|------------------|-------------|-------------------------|---------------|------------------|-------------|--------------------|---------|-----------|-------------|
| | Schemes (%) | Score 1 DEFRA | Score 0.5 Effect | Total score | Schemes (%) | Score 1 DEFRA | Score 0.5 Effect | Total score | Schemes (%) | Score 1 | Score 0.5 | Total score |
| Minimise soil disturbance | 70.4 | 0 | 19 | 9.5 | 88.9 | 0 | 8 | 4 | NA | | | |
| Maximise species diversity | 100 | 25 | 2 | 26 | 100 | 9 | 0 | 9 | 70 | 21 | 0 | 21 |
| Maximise crop diversity | 18.5 | 0 | 5 | 2.5 | 33.3 | 0 | 3 | 1.5 | 0 | 0 | 0 | 0 |
| Keep the soil covered | 70.4 | 1 | 18 | 10 | 77.8 | 1 | 6 | 4 | NA | | | |
| Build up soil organic matter | 70.4 | 0 | 19 | 9.5 | 77.8 | 0 | 7 | 3.5 | NA | | | |
| Maintain living roots all year round | 70.4 | 0 | 19 | 9.5 | 77.8 | 0 | 7 | 3.5 | NA | | | |
| Improve water infiltration | 70.4 | 9 | 10 | 14 | 77.8 | 3 | 4 | 5 | 23.3 | 6 | 1 | 6.5 |
| Improve water quality | 80.5 | 7 | 15 | 14.5 | 77.8 | 1 | 6 | 4 | 40 | 6 | 6 | 9 |
| Integrate livestock | 18.5 | 0 | 5 | 2.5 | 33.3 | 0 | 3 | 1.5 | NA | | | |

Source: the Authors.

Table 4. Scores for DEFRA Actions under the sustainable farming incentive.

| | Schemes (%) | Score 1 DEFRA | Score 0.5 Effect | Total score | N/A Grassland options |
|--------------------------------------|-------------|------------------|---------------------|-------------|--------------------------|
| Minimise soil disturbance | 50 | 0 | 8 | 4 | 0 |
| Maximise species diversity | 93.8 | 13 | 2 | 14 | 0 |
| Maximise crop diversity | 12.5 | 0 | 2 | 1 | 0 |
| Keep the soil covered | 62.5 | 3 | 7 | 6.5 | 5 |
| Build up soil organic matter | 62.5 | 0 | 10 | 5 | 5 |
| Maintain living roots all year round | 68.8 | 3 | 8 | 6.5 | 5 |
| Improve water infiltration | 68.8 | 3 | 8 | 6.5 | 4 |
| Improve water quality | 75 | 2 | 10 | 7 | 4 |
| Integrate livestock | 12.5 | 0 | 2 | 1 | 3 |

Source: the authors.

one), building up soil organic matter (19 from 27, zero scores of one) and maintaining living roots all year round (19 from 27, zero scores of one). These high scores are mainly comprised of 0.5 scores, that is, they are a consequential effect of the actions aimed at improving species diversity. These results also mirrored for permanent crop, but for grassland these are not applicable, as the permanent soil cover ensures minimum soil disturbance, keeping the soil covered, building organic matter and maintaining a living root system. For the SFI actions, the soil type regenerative core values again feature highly with an overall occurrence of 8 actions from 16 for minimizing soil disturbance, 0 from 16 for keeping the soil covered and building up soil organic matter and 11 from 16 for maintaining a living root system all year round.

Regarding water-based regenerative values, the scores are again relatively high for arable crops, 19 actions from 27 for improving water infiltration (nine scores of one) and 22 actions for improving water quality (seven scores of one). For grasslands, seven from 30 actions were linked to improving water infiltration, and 12 from 30 to improved water quality with both having six scores of one. For SFI actions, water infiltration featured in 11 from 16 actions (three scores of one), and improved water quality featured 12 actions (two scores of one). Notably, some options are specific to water infiltration and quality (see Example 3), and specifically, but not exclusively on intensive grasslands, the intended outcome is an increase in water quality (see Example 2).

Maximizing crop diversity does not feature at a high occurrence of actions or a DEFRA descriptor level (zero score of one). At the opposite end of the scale, integrating livestock scores very low values across the board, generating a total of 10 actions across all schemes and actions, none of which are a DEFRA priority (zero scores of one). In the case of some grassland options, payments are available for removing livestock, with two examples being SW9: seasonal livestock removal on intensive grassland at £115/ha. (Eur132; \$153), (HM Government 2023k) and, SW10: removing livestock on grassland in SDAs next to streams, rivers and lakes at £ 77/ha. (Eur88; \$103) (HM Government, 2023l). Figure 1 illustrates the nine regenerative core values ranked by the total assigned score and the DEFRA descriptors (assigned scores of 1).

From Figure 1, it can be observed that maximizing species diversity receives the highest total score of 62.5 and the highest score for actions by DEFRA descriptors (60), with consequential effects contributing only 2.5 (5 scores of 0.5) to the total score. Water quality and infiltration followed with scores of 27 and 21.5 and 17 and 15 for DEFRA descriptors. When the four soil-based regenerative core values are examined, the consequential effects of the DEFRA actions move to the fore compared to the stated descriptors, with organic matter being built up and soil disturbances receiving zero values for the DEFRA descriptors being minimized. At the bottom of the rankings are maximizing crop diversity and integrating livestock with both not included in the DEFRA descriptors and the only effects of adopting these being consequential with scores of 13 and 7, respectively.

Discussion

Regenerative agriculture is rapidly gaining traction in England as an approach to farming, alongside gaining a wider public identity through organizations such as Groundswell. Food manufacturing companies are identifying and advertising their products as being outcomes of regenerative agriculture practices, such as with McCain potato products and Unilever and its Coleman's mustard seed and mint leaf (McCain, 2023; Unilever, 2024). Improving soil health is the main priority that has emerged in both the regenerative scientific and practitioner literatures; coupled with improving ecosystem health and biodiversity. In

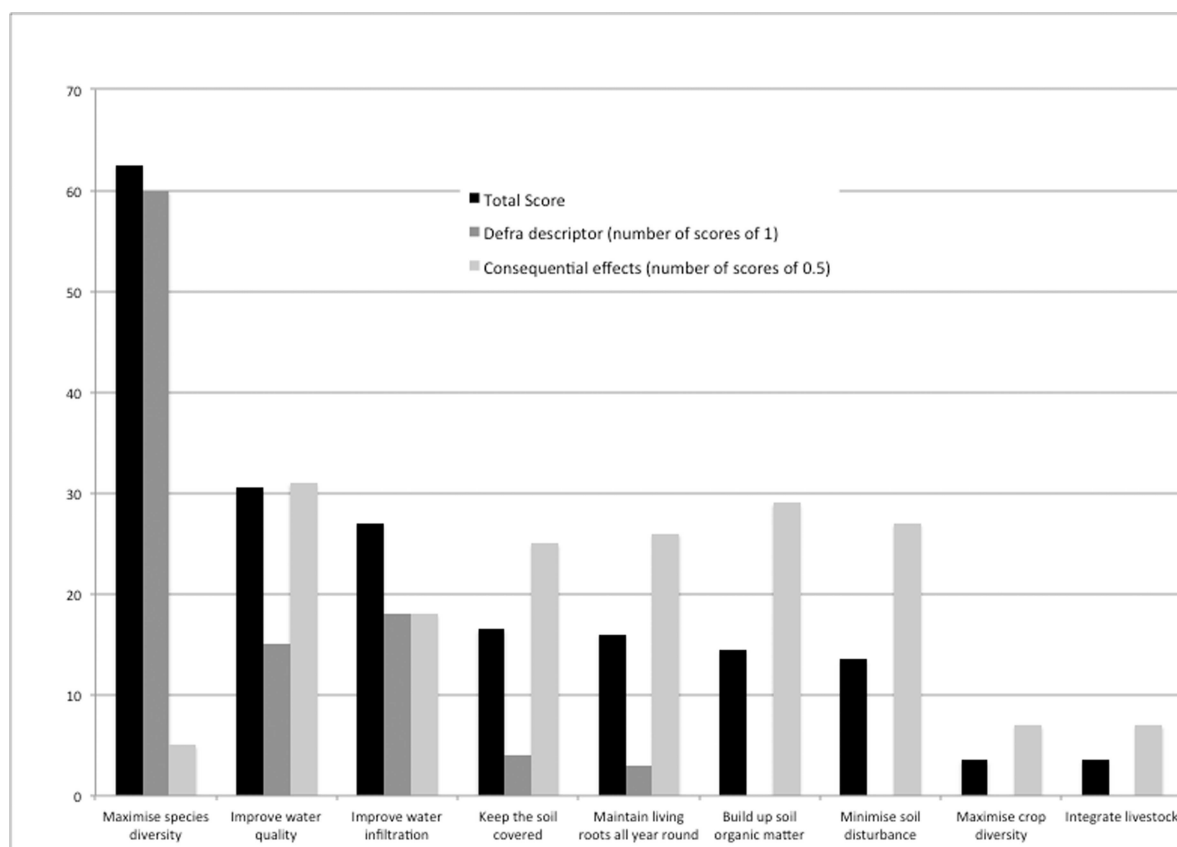


Figure 1. Regenerative core values ranked by total assigned including DEFRA descriptors and consequential effects (source: the authors).

comparison, food security and food safety appear to be low priorities, with animal welfare being the lowest priority (Newton et al., 2020). The literature reveals that the core principles all vary on a single theme, both globally and nationally, with a focus on preserving and improving soil and water quality and biodiversity. The UK government's design of a post-EU agricultural policy for England has been framed by the evidence of species decline and loss of biodiversity and the subsequent Environmental Act (HM Government, 2021a). The environmental policy imperative is evident in both the title and the criteria for financial support for farms under ELMs. The high score for species diversity as both a DEFRA descriptor and consequential effect suggests that this is the government's main objective for the future of land use in England. Agricultural policies prioritizing food production *per se* are not considered; rather, the sustainability of future agriculture and its natural resource base are prioritized. The challenges of supporting the balance between domestic food production and environmental sustainability continues (Lang & Barling, 2012). However, the concerns of farmers over the government's lack of support for domestic food production has resulted in policy responses from the Prime Minister and Defra (Beecham et al., 2023; DEFRA 2024a; Grylls, 2024).

Traditional cropping appears to be the main target for change under ELMs, with high payments available under both CS and SFI for replacing arable cropping with permanent wildflower or similar types of grassland or leaving stubbles over winter. Thus, effectively taking land out of production permanently or for longer periods of time. With most of 'crop replacement' type schemes, there are limited opportunities to graze livestock or make forage. The high scores for water infiltration and water quality by DEFRA descriptors and consequential effects also indicate that water preservation and quality are high priorities. Subsequently, DEFRA introduced more water initiatives under the SFI (HM Government, 2024), with a target of 60% water storage by 2050 and including payments for raising water levels in both arable land, LFAs and grasslands.

The qualitative approach adopted is similar to that utilized in its qualitative impact assessment of land management interventions on ecosystem services, which was the evidence basis for the ELMs (DEFRA, 2023c). The mapping exercise demonstrated that for species diversity, water infiltration and, to a certain extent, keeping the soil covered and maintaining a living root system do tally with the core principles of regenerative agriculture. Nowhere in the English policy literature is there a mention of regenerative agriculture *per se*. Under the landscape recovery banner, the government has funded a project in England for the River Axe on the Somerset/Dorset borders for farmers and landowners to restore 23.6 km of the upper river (Upper Axe Landscape Recovery, 2023). Additionally, the project will support regenerative farming on 23 farms and extensive grazing on the land neighbouring the river corridor to reduce diffuse pollution, phosphates and sediments entering the river, enabling cleaner water to flow (HM Government, 2023h).

In contrast to England, the transition of Scotland's agricultural support from the CAP-based system has been slower in its formulation and post-dates our research findings. Scotland's Agricultural Reform Route Map details the new supports to be implemented in phases from 2025 with four tiers of income support for farms (Scottish Government 2025a). The first tier requires farmers to meet basic criteria such as the management of climate emissions and biodiversity. The second tier adds a code of practice for meeting sustainable and regenerative farming practices aimed at reducing environmental emissions and restoring nature. Thereafter, tiers three and four payments are only available through competitive applications. The code states 5 principles of regenerative farming: minimizing soil disturbance; maximizing crop diversity; keeping soil covered; maintaining living roots and integrating livestock. The code is not a requirement, recognizing that farmers 'can choose how to use it to suit your business needs' (Scottish Government 2025b). These principles align with those presented in Table 1 above. An important difference between England's ELMs and Scotland's support is the use of production-related direct payments. For example, the Suckler Beef Support Scheme's conditional payments under tier one support the role of livestock in regenerative farming systems, as well as the importance of beef exports to Scotland's economy (Scottish Government 2025c).

The ELMs policy for England literature analyzed does not mention crop diversity or integrating livestock, and thus, the only scores for these are consequential because of other actions, i.e. only scoring values of 0.5. These could both be considered as agricultural business decisions rather than environmental decisions, especially the decision on what crops to grow during a rotation. It may well be the case that crop varieties grown in England may decrease if the uptakes of wildflower-type and ground cover-type actions replace those of conventional crops. Additionally, some proponents of regenerative agriculture use the term species diversity (Savills, 2021a, 2021b) rather than crop diversity (Knepp, 2023) (see Table 1), i.e. not distinguishing between agricultural crops and crops to improve wildlife. The CS and the SFI, with their incentivized actions, lean towards arable production and, to a lesser extent, intensive grassland, with the main aim of reducing run-off and the leaching of pesticides and nutrients into water courses, with payments for reducing inputs. From a livestock perspective, a number of schemes forbid grazing or conservation of forage on land under crop cover-type actions, therefore actively discouraging livestock on farms; however, integrating livestock is a key component of all the cited core values for regenerative agriculture, mainly for the use of manure for soil fertility reasons. One action under CS grassland is a payment to remove livestock from intensive grassland at certain times of the year that limits winter grazing, specifically on those farms that keep or overwinter sheep. This may result in a farmer decreasing the number of livestock on the farm to receive the payment. This may well be an attractive proposition for smaller livestock producers with limited labour supplies or those in disadvantaged areas. From a regenerative agriculture perspective, this is not useful to arable farmers considering the pursuit of a total regenerative route. A further discouragement would be that grazing is forbidden under many actions, so even if they were to undertake cover crop type actions, there would be a forage gap (scarcity) in the livestock production cycle, particularly in the beef and sheep systems. Apart from the benefits of manure, mixed cropping/livestock systems have been shown to be economically beneficial in developing countries (Ryschawy et al., 2012) and can result in lower inputs through more efficient nutrient cycling (Dubeux and Sollenberger, 2020; Watson et al., 2005). Livestock can be beneficial in other ways. Winter grazing of sheep on cereals, once a common practice, has been shown to reduce yellow rust (Emmerson, 2021) but can lead to an increased need for weed control (Miller et al., 2015). Livestock producers have often used brassicas

and root crops to bridge forage gaps in the animal production cycle; however by the nature of these crops, they would result in large periods of bare soil so would not really be a viable alternative for arable farmers considering the full regenerative route. Further barriers to integrating livestock in large arable producing counties may be a lack of infrastructure, skilled labour and large field size owing to the historic removal of hedgerows and combining fields as well as the need to purchase additional feed and erect specialist buildings. It would be costly to introduce new livestock enterprises for very little return. It appears that the new environmental schemes overall are not incentivizing any kind of livestock production, and if DEFRA achieves their stated goal of 70% of Land on 70% of farms (HM Government, 2023a), there could be a large reduction in livestock numbers in England.

Although financial implications are beyond the scope of this paper, there are options for stacking schemes on a farm to compensate for the loss of income, as the Basic Payment Scheme is phased out, a factor examined in detail by the Agriculture and Horticulture Development Board (AHDB), (2023), specifically on beef and sheep units. For regenerative farmers, they may well be undertaking many of the actions available as part of their usual farming routine, and they could make a case for matching this to an action under the CS or SFI to receive a payment. The DEFRA guidance does not make it clear whether this is acceptable or not and it may well be down to the individual farm inspector during the application process. However, farmers currently on the CS can apply to run SFI concurrently, providing that the actions are compatible, as they will not be paid for the same thing twice. (DEFRA, 2023b). They could then increase revenue by taking on smaller actions such as grants for tree and maintenance, heritage issues, waterway buffer strips etc., thereby stacking payments.

The high target uptakes indicated by HM Government (2023a), suggest that DEFRA are approaching England as one large-scale farm to meet their targets, hence it is the case that the higher area payments available are for items such as: buffer strips and putting land aside to feed pollinators and wild birds/wildlife, small areas and corners of farms that may or may not be productive. DEFRA may be hoping to accrue many smaller areas of land under the various schemes, as people pursue higher payment bands. Entrance into the schemes is a competitive process, with eligibility uniform across both the CS and SFI, a minimum of 5 ha of land and 5 BPS entitlements (HM Government, 2023i). There is some overlap in the schemes for example, AB8: establishing and maintaining flower-rich margins and plots under the CS and IPM2: flower-rich grass margins, blocks or in-field strips under the SFI both paying £673/ha (Eur774; \$895) (HM Government, 2023a, 2023b). This may indicate that perhaps one of the aims of the SFI is to pick up those not already involved in the more demanding CS.

A single integrated online service where farmers can select the combination of actions across the two schemes that work for them is scheduled to be implemented in 2025. Farmers apply for the right options, rather than worrying about which scheme they are labelled, with parity of payments for similar actions. Farmers won't be able to apply for the same thing twice (NFU, 2024b). The membership of the schemes is a competitive process, so there is the potential to incur costs through the employment of consultants and still be unsuccessful. Assessment involves methods such as providing photographic evidence and GPS mapping of areas of land alongside inspections from DEFRA-appointed or -approved officials, mainly the Rural Payments Agency (RPA) Field Officers, who portray themselves as friendly advisors offering support, rather than inspectors and enforcers of rules (for example, see HM Government, 2023j; Rural Payments Agency, 2022, 2023). In January 2024, the payment rates for both CS and the SFI were increased by 10% (DEFRA, 2024b) alongside making schemes more flexible and easier to access, with a streamlined single application service for farmers to apply for SFI and CS. In late March 2024, DEFRA welcomed new SFI applicants to the 17,000 who had applied in 2023 (DEFRA, 2024a), revealing that approximately one percent of those who applied for the SFI in 2023 had entered 80% or more of their land. This raised concerns regarding nationally produced food self-sufficiency, which, according to the AHDB had declined from 75% in 1984 to a current figure of 60% (Corsair, 2022). As a consequence, DEFRA (2024a) placed an area limit of 25% of a farm's total land on six of the nine SFI actions, with no area limit on the two buffer strip actions. There was also no limit placed on the area of legume fallow allowed, as DEFRA saw this as possibly being an integral part of an arable rotation.

This paper has investigated the contents of the first wave of ELMs. An important next stage for research is to look at the implementation from the perspective of regenerative farmers. Investigating the choices and lived experiences of ELMs actions by regenerative farmers. The reasoning for their choice of applications to

implement specific measures, both financial or environmental. Once regenerative farms are established on the schemes, there is further scope for examination of the outcomes of the applications in practice and the positive or negative financial contributions to the farm business. The research presented here offers a starting point for framing investigations into such lived experiences among farmers pursuing regenerative principles and outcomes.

Conclusions

The new government-funded SFI and CS schemes for England go a long way towards addressing the core principles of regenerative farming through the complementary environmental goals of the schemes. The contribution of this paper is that it presents a tool that can be used to assess the extent to which the existing and further new options under the ELMS match the needs of regenerative farmers. As the uptake of the schemes increases, elements of the regenerative approach are taken up, in turn, by those farming in a more conventional fashion. Farmers considering following a total regenerative route will be constrained from integrating livestock by the lack of incentives and the potential barriers generated by the more specific criteria. This may promote the reduction of ruminant livestock on England's farms through the back door. However, with the adoption of regenerative farming by major food manufacturers as part of their brands' environmental credentials, it may be the case that DEFRA may need to consider addressing regenerative agriculture as a nature-friendly way of food production for both farmers and consumers alike. DEFRA's ELM policies in England will need to address regenerative farming and the role of livestock grazing more explicitly and look to the example of Scotland's policies in this regard.

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