Regenerative Agriculture

A guide to the main principles and key considerations for farming businesses exploring regenerative agriculture methods.

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Regenerative agriculture is an approach which is generating considerable interest as farm businesses seek to rise to the challenge of producing food profitably, but with a lighter environmental footprint. It is a farming system that is still evolving in terms of its implementation on UK farms, but is generating attention because of its potential to reduce costs and improve margins, while enhancing soil health.

Strutt & Parker's farming team offers a guide to the main principles and highlights some key considerations for farming businesses exploring regenerative agriculture methods. We have also included a glossary of terms commonly used in relation to regenerative agriculture.

1. INTRODUCTION

1.1. The concept of Regenerative Agriculture (RA) goes a step beyond the idea of farming sustainability. The basic principle is to 'regenerate' the ecosystem where agriculture has been the cause of ecosystem damage. The thinking is that where sustainable agriculture encourages the maintenance of the ecosystem as it is currently functioning, regenerative agriculture seeks to improve the ecosystem and enhance the services it provides.

1.2. Soil is the headline beneficiary of RA. Soil in this context is defined in its broadest sense; this includes the entire chemical, mineral, structural, animal, bacterial, and fungal make up of soil, as well as the general abundance, health, and function of soils. Water and air quality are also targeted by RA. The principles (set out in 1.6) tend to affect air and water quality indirectly through the improvements to soil management.

1.3. While soil takes centre stage in the principles of RA, the ultimate aim of farming, to produce primary products and food, is at its core - but with a view to enabling and, most importantly, enhancing those goals long into the future.

1.4. RA has a social justice angle too, and where traditional land management has often alienated those not directly involved in the decision making, RA seeks to reconnect people and their needs to farming, landscape and nature.

1.5. Farmers are being increasingly well educated in the practices of regenerative farming and most are finding that they already adopt some RA methods. With an enhanced awareness of the potential negative impacts of conventional farming and an anticipated shift in focus in government policy away from production, below are some pointers for those that are seeking to make some changes to their farming system:

1. Start with a solid understanding of the current environmental health of your farm. Knowing the carbon footprint of your farming practice, identifying which aspects of the farm are most at risk (e.g. water quality, soil erosion) and highlightling which aspects to focus on will be a great place to start. It will also allow you to measure progress. You may also take this opportunity to take stock of the diversity of wildlife present.
2. It is important to tailor the appropriate regenerative methods to each individual farming system based on equipment, time available, soil types, and enterprise structure.
3. Make changes gradually to determine which practices are making positive changes and to protect margins.
4. Consider what interests you most about regenerative farming – persevering when you are finding things difficult will be a lot easier if you are passionate about the process.
5. Be patient – regenerative practices can be slow, inconsistent and difficult to measure.

1.6. The extent and pace of change on any one farm is not dictated by specific rules. There is no single RA association that can qualify or disqualify you as a follower of a 'regenerative agriculture principles'.

The generally accepted principles of Regenerative Agriculture are:

1. Vegetative ground cover for as much of the year as possible
2. Limiting mechanical soil disturbance to a minimum
3. Increasing plant diversity around and amongst crops and pasture
4. Living root mass in the soil throughout the year
5. Integrate grazing livestock on both pasture and arable systems.

2. REGENERATIVE AGRICULTURE AND SOIL CARBON SEQUESTRATION

2.1. Soil organic carbon (SOC) is the form in which carbon dioxide is sequestered in soil. SOC is a factor of soil organic matter (SOM). The standard estimate is that SOC is 58% of SOM.

2.2. SOM is the organic component of soil, consisting of three primary parts including:

1. Small (fresh) plant residues and small living soil organisms
2. Decomposing (active) organic matter
3. Stable organic matter (humus).

The quantity of SOM present can alter through management and through neglect. RA looks to increase SOM – not directly with the objective of sequestering carbon dioxide from the atmosphere, but rather to improve the quality and performance of soil as the provider of nutrients, habitats, ecosystems, and the services they provide to humans.

2.3. Generally speaking, soil health and agricultural performance benefits from a higher SOM content. With an increase in SOM, soil structure becomes more stable and friable, water drainage and moisture holding capacity is improved, the availability of oxygen to plant roots is improved, and the risk of nutrient leaching is reduced. Other benefits observed are that a soil high in SOM will have a much more diverse population of microbes and invertebrates which can help to control crop pests and diseases, and mycorrhizal fungi species are better able to form symbiotic relationships with crops in these conditions, effectively extending the crop's root system.

2.3.1. For agricultural soils there is a level of SOM which can be unstable and unsustainable (if the ratio of clay to SOM is over 13:1 it will become very volatile as the SOM relies on clay as a bonding agent) and agronomically, very high SOM can begin to lock up important trace elements such as molybdenum. Typically, arable soils should aim to be at or over 4% SOM and permanent pasture should aim for over 10% SOM.

2.4. It is often suggested that adopting RA will result in an increase in SOM and therefore sequestered carbon dioxide. However, the rate of carbon sequestration possible in any one soil depends on a large number of variables, and will vary from one square inch of soil to the next – it is therefore difficult to predict at what pace the SOC will increase after adopting RA, as it is an inexact science.

2.5. One-off applications of organic matter to soils (in the form of farmyard manure, sewage sludge, chopped straw, or others) are not a one-way street to building SOM, there are many ways in which the organic matter from these applications can be lost to the atmosphere, surface water, and ground water. To truly make a difference to the long-term SOM content, usually a change in the management approach is needed.

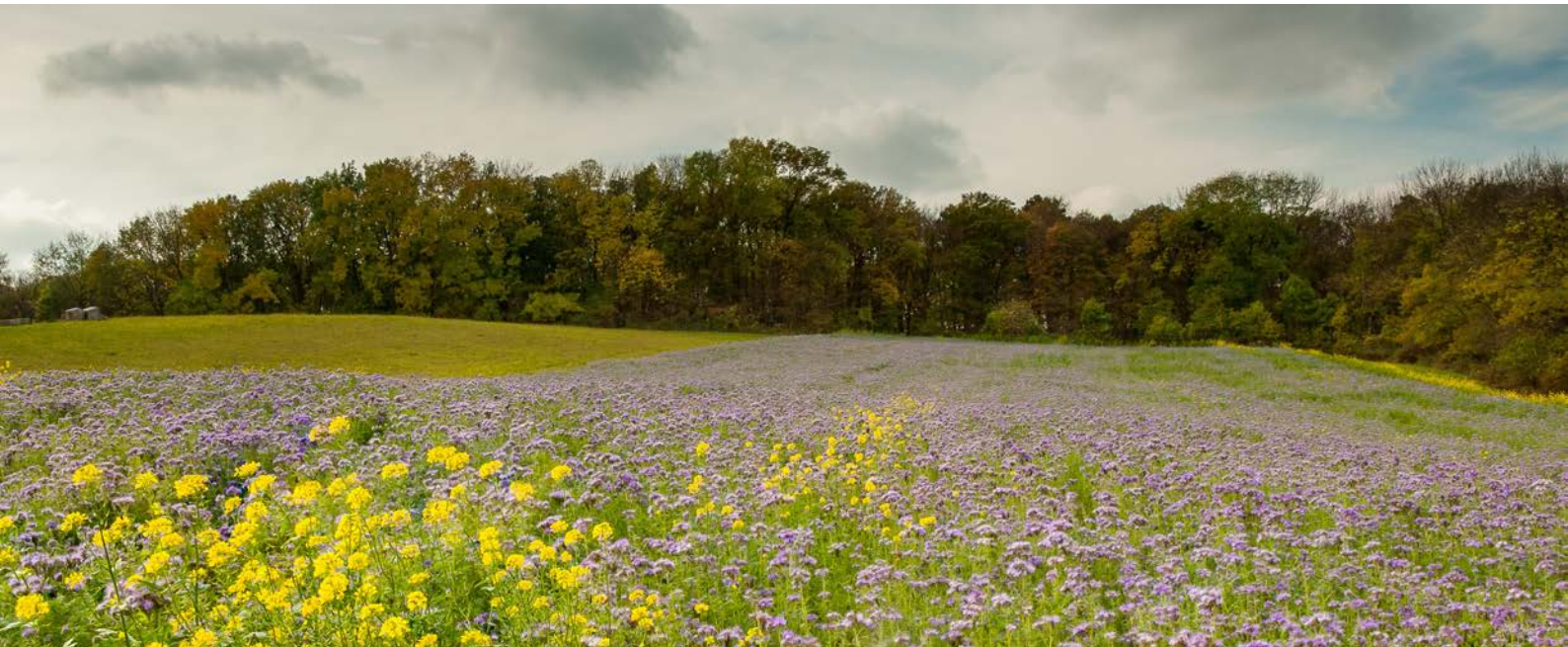
2.6. RA adopters are encouraged to monitor their soils regularly and to adjust their farming method to find the practice which best enhances the SOM. Only the regular measurement of SOM and other soil quality factors can give farmers a steer on the impacts of their actions. **As the maxim goes – 'if you're not measuring, you're not managing'.**

2.7. There are various ways for soil to be tested for SOM and SOC, and they all tend to produce quite variable results. With soil testing it is key to aim for a replicable method.

2.7.1. Soil samples should be taken at least annually to deduce a trend, they should be collected in exactly the same fashion each time in as similar weather and seasonal conditions as possible. The samples should be taken from the same depth of soil, and the locations used each time should be as close to each other as possible (you could use GPS mapping for this). There are apps available to farmers to keep track of this such as Soilmentor from Vidacycle, the SoilBio app from SoilEssentials, and mySOYL from Frontier Agriculture Ltd.

2.7.2. There are many different laboratories where SOM tests can be carried out – you should aim to use the same laboratory each time, and if that isn't possible you should ensure that the tests carried out are as similar as possible to the previous year's samples.

2.7.3. Typically, SOM is tested using a loss on ignition test. The most common alternative is Total Organic Carbon (TOC) analysis which deduces the soil organic carbon (SOC), from this the SOM can be estimated by multiplying by 1.72 (on the basis that SOC is 58% of SOM).



3. THE IMPLICATIONS AND OPPORTUNITIES FOR ARABLE FARMERS

3.1. Vegetative ground cover for as much of the year as possible ('Principle 1')

3.1.1. Leaving soil bare for prolonged periods of time (for a fallow year, ahead of a spring crop or even after harvest and before sowing a winter crop) is becoming increasingly rare. The adoption of cover crops, catch crops, overwinter growth and retention of previous crop residue is definitely increasing. Although uncropped soils have advantages in terms of logistics, cultivation timings and also 'green bridge' prevention, there also numerous downsides.

3.1.2. This principle may lead to a farmer using any of the following (see glossary for details):

1. Catch crops
2. Cover crops
3. Undersowing
4. Temporary leys (herbal or leguminous).

3.1.3. And avoiding:

1. Ploughing or reduced tillage
2. Overwintered stubbles where volunteers are sprayed off.

3.1.4. A farmer who wishes to fully embrace this principle may wish to expand the length of their crop rotation and move towards a mix of crops and varieties which spreads the workload during harvest so that there is time to establish catch/cover crops at this busy time of year. It is generally accepted that for a cover crop to be of substance it must be established by the end of August.

3.1.5. Keeping the soil covered as much as possible brings the following advantages:

1.	Protection of the soil from wind and rain erosion
2.	A reduction of water runoff due to infiltration by plant roots, this provides protection to nearby courses from leaching of chemicals, fertiliser and silt
3.	Capture of fertiliser nutrients (including nitrogen, phosphate and potassium)
4.	Suppression of weeds
5.	Cover crops and crop residues acting as 'green manures' can be broken down and converted into organic matter
6.	Continuous food source for soil biology
7.	Habitat opportunities for organisms above ground.

3.1.6. Adopting this principle also ensures that Principle 4 (a living root mass is in the soil throughout the year) is followed too by default.

3.1.7. Costs of following this principle:

Common costs of cover crop seeds can range from £40/ha for a single variety cover crop to £80/ha for a more complex seed mix. People will also use spare seed from their own stores – this can be very cost effective, but may allow diseases such as take-all and club root to persist.

3.2. Limiting mechanical soil disturbance to a minimum ('Principle 2')

3.2.1. This principle may lead to a farmer using any of the following (see glossary for details):

1. Direct drilling
2. Zero tillage
3. Controlled traffic farming in combination with subsoiling
4. Arable reversion or temporary leys
5. Cover crops and catch crops (especially those with deep-rooted species which can act as a vegetable plough).

And avoiding:

1. Ploughing
2. Top-down rotavator type cultivation.

3.2.2. RA tends to identify ploughing as a major source of soil health damage and ecosystem function failure. It is thought to disturb the mycorrhizal fungi that would have otherwise benefitted crop growth, and of course uses large quantities of diesel.

Ploughing, however, can be part of a long-term strategy in regenerative systems. It tends to be only used very occasionally to alleviate badly compacted soils or to convert temporary leys to arable within a wide arable rotation.

3.2.3. Subsoiling is often recommended as a means to encourage drainage in naturally wet fields, but it is not recommended in RA to be used other than very occasionally or to alleviate the compaction caused under tramlines where controlled traffic farming is practiced.

3.2.4. Costs of following this principle:

The move to reduced or zero tillage will often require the purchase of new equipment.

Direct drills range from £10,000 for smaller second-hand equipment– to £100,000 for larger new equipment.

Shallow tine cultivators range from £5,000 to £20,000.

Grants can be available for equipment - for example, in the past through the Countryside Productivity Small Grant Scheme in England and the Sustainable Agriculture Capital Grant Scheme in Scotland. In England, we are expecting the Farming Investment Fund to open this autumn which will offer capital grants for a wide range of equipment.

The following costs are taken from the National Association of Agricultural Contractors (NAAC) Contracting Prices guide (2020) to demonstrate the direct costs of different tillage intensities;

Tillage and establishment method		NAAC Contractors Charges 2020
Higher Intensity	Deep ploughing plus conventional drilling	£120/ha
	Ploughing plus conventional drilling	£115/ha
	Rotavating plus conventional drilling	£119/ha
Lower Intensity	Spring tine harrowing plus conventional drilling	£90/ha
	Direct drilling	£60/ha

3.3. Increasing plant diversity around and amongst crops and pasture ('Principle 3')

3.3.1. Like all living things, soil organisms have varying dietary requirements and thrive on a varied mix of food sources. Arable rotations that focus solely on profit are usually short and also low in species diversity. A rotation of predominantly cereals with few or no break crops not only reduces the diversity of species in the soil, but also the health of the ones that are able to survive. The soil structure is also impacted as it requires a range of rooting systems from different plants to improve the structure throughout the soil profile. Furthermore, crops have a varying nutrient requirement, so a diverse rotation also helps to ensure that the soil does not become depleted in one mineral while wasting others. Deeper rooting plants also help to increase the availability of nutrients to shallower rooting plants.

3.3.2. This principle may lead to a farmer using any of the following (see glossary for details):

1. Longer more complex crop rotations
2. Integrated weed management which allows less harmful arable weeds to co-exist with arable plants
3. Herbal and leguminous leys as catch or cover crops
4. Arable reversion and/or temporary leys
5. Wider and better managed field margins
6. Undersowing arable crops.

And avoiding:

1. Heavy-use of herbicides, especially broad-spectrum herbicides which can kill harmless plants
2. Herbicides as crop desiccants before harvest.

3.3.3. Costs of following this principle:

Having a longer more diverse crop rotation will mean that the area of cash crops on any one farm is reduced. It is hard to define how this will affect the bottom line of any one business, as it depends on too many variables. However, adopting this principle is likely to cause a reduction in the cropping turnover.

Some of the loss of income from fewer acres in cash crops may be defrayed by entering the farmland into an agri-environment scheme. For example, in England Countryside Stewardship includes rotational arable options, such as a two-year legume fallow (AB15), which pays £522/ha while also helping to improve soil health and nutrient availability.

Management of this CSS option includes establishment, occasional topping to control weeds, and cover crop destruction – we estimate management costs of £150/ha per year.

Similar agri-environment options can be found in Scotland's Agri-Environment Climate Scheme (AECS) such as: stubbles followed by green manure in an arable rotation which can pay £498.49/ha, or forage brassica crops for farmland birds which can pay £463.36/ha.

3.4. Living root mass in the soil throughout the year ('Principle 4')

3.4.1. This principle is related to Principle 1 and relies on many of the same actions.

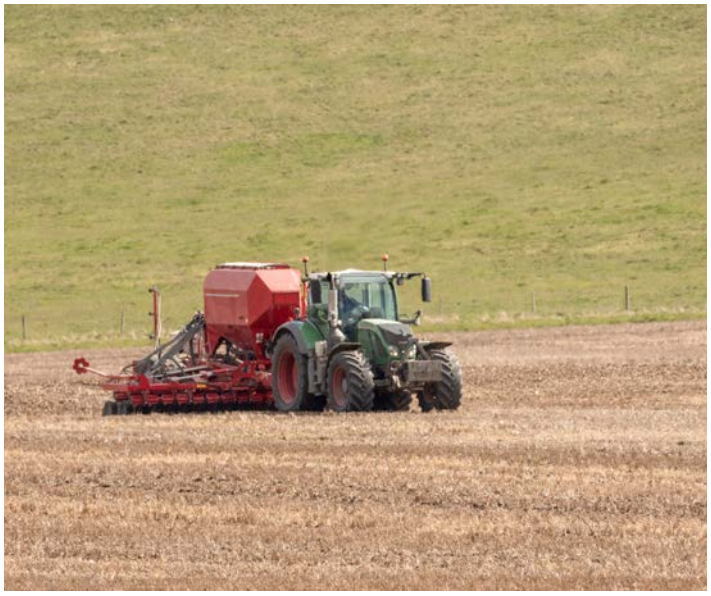
3.4.2. The value of this principle is that it allows mycorrhizal fungi to be carried from one crop to another. Bare arable soils provide little nourishment or habitat for mycorrhizal fungi, and neither does over-wintered stubble which has been sprayed or killed off.

3.5. Integrate grazing livestock on both pasture and arable systems ('Principle 5')

3.5.1. The rationale behind this principle is that livestock's inclusion in arable rotations delivers many benefits to the soil in terms of soil structure, plant diversity, microbial diversity – indeed all biodiversity – and fertilises the soil with nutrients.

3.5.2. This could be done in a variety of ways:

1. By using cover crops and catch crops as grazeable ground cover between arable crops, a farmer can have livestock on their farm on a temporary basis. These animals will help to control arable weeds, and will convert the plant biomass into nutrients for the soil, while the manure will feed the microbes and soil animals that are so helpful in making nutrients available to crops and building soil structure.



2. By using temporary arable reversion within the rotation. Having a very wide crop rotation can provide the opportunity to rotate temporary grass leys around a farm. This can be very good at providing the benefits required by both the soil and the farmer, especially with blackgrass control.

3.5.3. Costs of following this principle:

The extent to which this principle is adopted will vary widely. So the costs are hard to assess.

To plant and manage a temporary grass ley for a licensee grazier, the following partial budget may be an example:

Annual partial budget for a two-year temporary grass ley with a grazing licence

Income	£/ha
Grazing licence fee	£90
Expenditure	
Seed	£42
Establishment by drilling with harrow	£34
Gross margin	£14

Notes:

A major benefit of including livestock grazing in an arable rotation is the nitrogen and general plant nutrition that animals add to the soil. The value of this varies from system to system, but is not reflected in the partial budget above.

Fields which have previously been arable-only may require fixed fencing, this can cost between £5-8/m.

Fencing costs can be defrayed by capital grants such as those available through Countryside Stewardship where £4/m is available. NB this is only available in any of these three circumstances:

1. in conjunction with a habitat management or creation option where new fencing is required to meet the option grazing requirements;

2. to prevent water pollution in areas targeted for the reduction of water pollution caused by farming, or;

3. to protect environmental features.

Usually a grazing licensee will be expected to provide their own temporary fencing where it is needed.

A grazing licensee may require an available supply of water to the land under the licence, especially if using cattle to graze. With sheep graziers it is common for the grazier to provide their own water with the use of portable water tanks.

The income from a grazier's fee can vary widely depending on the local market for grazing land and the quality of the grazing available to the livestock.

4. IMPLICATIONS AND OPPORTUNITIES FOR LIVESTOCK FARMERS

4.1. Introduction

4.1.1. RA attempts to take some of the pressure off soils which is imposed by modern intensive agriculture. This is in contrast to modern housed cattle systems of livestock production - where animals mostly do not graze living plants.

4.1.2. RA encourages livestock grazing in the field as much as possible and in that respect advocates a reduction in mechanisation. The belief behind these principles is that farmland and soil management should aim to mimic natural grassland grazing as much as possible, as the grazing patterns of wild herbivores is believed to build up soil organic matter and enhance general soil health.

4.1.3. Using mob grazing (see glossary for details), and increasing the diversity of grazeable plants in the sward, RA advocates a less intensive approach to livestock production. The financial benefit of this model can often be reflected in decreased overhead costs in terms of machinery, housing, plant protection products, fertiliser, and veterinary and medical costs which result from the change to a less stressed system, as well as the increased value of the product (which may occur through the sale of the product under a certification scheme or through direct sales to consumers seeking this kind of product).

4.2. Vegetative ground cover for as much of the year as possible ('Principle 1')

4.2.1. RA focuses on pasture production and grazing as opposed to housed systems. As such, RA requires animals to have something to graze outside for as much of the year as is reasonably possible. Farmers may use the following methods to fulfil this principle:

1. Arable reversion – regenerative farmers will find that they need to increase the proportion of their farm in pasture or temporary leys (either grass-based, herbal or leguminous).
2. Longer arable rotations – these may get longer on a farm which adopts the principles of RA – partly to increase plant diversity, partly to enable better integrated crop management, but also to provide grazing livestock with a broader healthier range of different grazing fodder.
3. Cover and catch crops – these may be used on a farmer's own land and livestock grazing can be a good way to destroy (and benefit from the feed value of) this crop before a new crop is drilled. Alternatively, a neighbouring farm without livestock may make catch and cover crops available for grazing on a temporary basis.
4. Overseeding – to change the species mix of a sward RA farmers may consider this method as it does not require the use of ploughing or cultivation.
5. Undersowing – this will allow an RA farmer who is either doing arable reversion or putting in a temporary ley to establish a crop without destroying the current one.

4.3. Limiting mechanical soil disturbance to a minimum ('Principle 2')

4.3.1. This principle is easier for a livestock farmer to follow than an arable farmer. For example, the re-establishment of pasture can be done with the introduction of new seeds with slot-seeding and/or overseeding.

4.4. Increasing plant diversity around and amongst crops and pasture ('Principle 3')

4.4.1. Modern grassland production has focused largely on just two or three species of grass. RA advocates the introduction of a broad array of different grazeable species, including legumes and herbs.

4.4.2. The benefit to soils of this approach is that different plants provide different benefits to the soil fauna and microbes, as well as providing a broad array of root depths. The benefits that an RA farmer may see from this approach is that a broader spectrum of species in their pasture will flourish at different times of the year providing a smoother pattern of crop growth through the growing season than when one single species is grown. Added to that, pasture with a diversity of plant species can adapt better to dry conditions and wet conditions.

4.4.3. Ryegrass monocultures are more vulnerable to disease and stress than diverse grassland.

4.4.4. Again, plant diversity may be achieved by overseeding pre-existing pasture or planting new pasture.

4.5. Living root mass in the soil throughout the year ('Principle 4')

4.5.1. This principle is largely taken care of by the measures listed under Principle 1. But it underlines the need to avoid overgrazing pastures and the ratio of livestock units per hectare should be adjusted throughout the year to maintain healthy ground cover.

4.6. Integrate grazing livestock on both pasture and arable systems ('Principle 5')

4.6.1. Many modern mixed farms don't rotate their livestock around their arable area, as usually the farm is permanently split between different enterprises. RA tries to encourage farmers to move to a whole farm rotation which includes grazing of temporary leys within the arable rotation. RA does not, however, tend to advocate disturbing permanent grassland to bring it into the arable rotation.

4.7. Other features of RA on livestock farms:

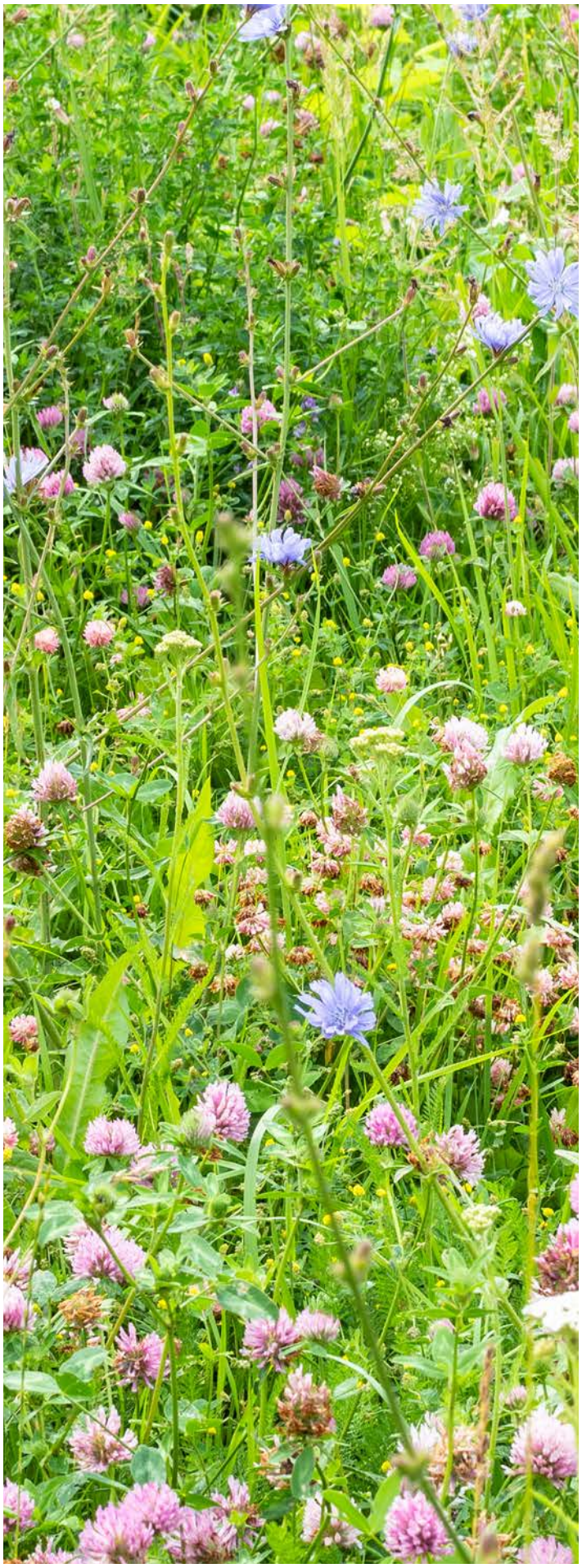
4.7.1. Mob grazing

1. This method of using grazeable land has become more popular in the past two decades. As opposed to set stocked pasture, or indeed over-grazed pasture, mob grazing uses regular livestock movements to ensure optimal grass utilisation. Within RA the aim is to graze off only 1/3 of the cover present, to trample in 1/3 of the cover, and for 1/3 of the grass to be left still growing.

2. Mob grazing requires close monitoring to avoid the grass present being grazed beyond the 1/3 goal.
3. The fences used to make this possible need to be temporary so that the farmer can adjust how much grass is available to the flock or herd at any one time. As such this system requires a small investment in temporary electric fencing equipment.
4. Water trough systems also need to be arranged so that they can be moved easily to different blocks of a field. Setting this up can be a costly exercise.
5. Within an arable system which aims to introduce temporary leys for cattle mob grazing it would still be wise to have permanent fencing around any fields that will have livestock grazing during the rotation (this is less important with sheep). This will be a significant investment for many farms, but one which in some cases can attract grant funding under existing agri-environment schemes and capital grants.

4.7.2. Composted farmyard manure

1. RA farmers will be very reluctant to export straw from arable land unless it will be returned in the form of farmyard manure. RA farmers who have already got livestock within their arable rotation will tend to compost farmyard manure (derived from the winter housing) as the composting process allows it to break down into a product which is very good food for soil micro-organisms and fauna. The aim is to encourage a virtuous cycle where healthy soil flora and fauna can further process the dying roots and leaves of plants to produce soil organic matter.
2. If an RA farmer has none of their own livestock to house over winter, they may consider a straw-for-muck deal with another farmer with housed livestock.



5. CAN A SYSTEM BE ENVIRONMENTALLY FRIENDLY AND PROFITABLE?

5.1. The adoption of regenerative farming into UK agricultural systems is producing great visible results for the features already discussed. However, because many of these measures require long-term implementation and are often adopted in conjunction with other regenerative techniques, it is very difficult to quantify the effects of each regenerative practice in isolation. Compounding this further is the fact that farming consists of multiple biological systems and processes that vary naturally anyway. To add more complication, the weather affects all of these systems and cannot be predicted or controlled. Therefore, in order to quantify the effects of regenerative farming on both the environment and a farm's financial results, measurements have to be taken over multiple years to gain a reliable average.

5.2. It is however possible to calculate how adopting some of the above measures will affect the profit of a harvest year in isolation. Here are just a few examples:

1. If attempting to conserve soil structure by direct drilling instead of conventional tillage methods, the operation costs are reduced by up to £50/ha.
2. Planting a green manure of around three or four species will increase seed costs that year by around £30/ha.
3. Reducing inputs to optimise crop margins – i.e. using a realistic 'potential yield' of your land and only applying the necessary inputs to achieve these yields has been seen to reduce variable costs by £25-£80/ha in winter wheat.

5.3. By comparing these savings to any consequential changes in yield (there is likely to be a drop in yields per hectare), the effect on gross margin can be calculated. However, this will not give an accurate representation of the cost/benefit of a regenerative method if you just look at individual harvest years in isolation. They are however very useful to monitor.

5.4. Businesses should structure investment into new equipment in a sensible way to reduce the risk of farming with 'two' systems and therefore having higher fixed costs from depreciation and repairs.

6. FUNDING AND SUPPORT FOR RA

6.1. There are opportunities and government schemes appearing which support the adoption of regenerative farming:

1. We expect the government to support many of these principles through the Sustainable Farming Incentive (SFI) and the Environmental Land Management (ELM) schemes.
2. As mentioned previously, support is already available under Countryside Stewardship for herbal leys, cover crops, legume fallow, fencing, water supplies, and capital grants schemes can fund some equipment, such as direct drills.

6.2. Product premiums — As with organic agriculture, where products receive a premium value, products from RA may be able to achieve a better market price than the equivalent conventional product. There is no single authority on RA as there is with the Soil Association for organic farmers, and as such there is no single label which marks out products from RA. However, several groups do exist and alternative routes to market are developing which can be used by RA farmers. Examples of this are:

1. Pasture For Life – a Community Interest Company (CIC) which has a set of certification standards for pasture-fed meat allowing farmers to use the Pasture For Life brand.
2. Harvest Bundle (harvestbundle.co.uk) – an online platform for advertising produce to sell directly to the consumer.
3. Farms to Feed Us (farmstofeedus.org) – a database connecting producers and consumers.

7. SO WHAT MIGHT BE THE DOWNSIDES TO REGENERATIVE AGRICULTURE?

7.1. Increased weed burden

Generally speaking, the control of weeds is a major hurdle for practitioners of RA. Regularly moving land between arable and temporary leys, and not using inversion tillage, land can build up a large burden of arable and pasture weeds. Lower potential yields and a high regard for the soil biology will disincentivise a regenerative farmer from the use of large quantities of herbicide to control these weeds, which can compound the issue further. Using a diversity of tillage methods, and altering cropping rotations may prevent weeds from gaining a foothold, as following a rigid routine can allow weeds to develop a resistance to your farming method. With experience and a proportionate approach, the weed problem can become more manageable with time.

7.2. Reduced yields

As mentioned previously, there tends to be a reduction in arable farming yields, at least in the short term. The focus in RA tends to be more on the net margin than the cropping turnover, as less weed control, less suitable seed beds (at least initially as the soil structure is improving), and fewer pesticides will all lead to a lower yield than a modern high-input farming system. It is important for RA farmers to be realistic about the yield prospects on their farm and to think more broadly about the inputs that can be afforded by each crop. The belief behind the movement is that a focus on a healthier soil and ecosystem will enable nature to 'pick up the slack' and in the end provide a better net margin than a conventional system.

7.3. Agronomic and scientific advances

With RA focussing on precision and efficiency of inputs, there has been a concerted effort by agri-chemical producers to develop products which can supplement RA. These products allow inputs to be more efficiently used by crops and improve crop performance. Examples of these are products which enable crops to utilise nitrate fertilisers more efficiently, or sprays and seed dressings which make crops become nitrogen fixing, and applications which may enhance soil and plant biology, such as adding a drench at drilling to boost nitrogen and phosphorous releasing bacteria. Some RA farmers make large savings or even eliminate the need for insecticides, some fertilisers, growth regulators and seed treatments.

7.4. Unpredictability

When farmers have read all there is to read about RA, and have heard all the experts speak, they may be raring to go with RA. However, the move from their old system to their new system will not usually be an easy ride. It is highly likely that the negative impacts of RA on their farm will be felt keenly to begin with. It will take time for the changes that they have made to bear positive fruit, and in all cases the rate of change to that point is unpredictable. It is hard to make any certain forecasts of income in farming, harder yet will be making forecasts when a switch to RA is made. It may take a full rotation of around five years for many of the benefits to be seen.

7.5. If it sounds too good to be true....

As is often the way with newly popular ideas, there is a danger that it could be targeted by people looking to make a 'quick buck'. There will be people trying to sell the perfect solution to RA's problems, and these might be found to come at a great cost for little reward. It must be remembered that if it sounds too good to be true - it probably is.

7.6. Further paperwork and compliance

Looking further ahead, if the interest in RA remains strong among farmers and consumers it is possible that it may find itself the subject of further interest from regulators and industry bodies. If in the future farmers wish to obtain premium prices for food produced under RA principles, then they may have to sign up to some level of certification. This will inevitably involve paperwork and farm inspections – in a similar way to organic certification. Whether and how this comes about remains to be seen.

8. GLOSSARY

Arable reversion	Reverting arable land to pasture.
Arable rotations	The different farm crops sown on the farm in a rotating sequence.
Biodiversity	The diversity of life in terms of species and animal abundance.
Catch crops	Crops used between harvest and the autumn drilling season to maintain ground cover and prevent available nutrients from leaching out of the soil.
Compost	Farmyard manure which has been allowed to decompose; when applied to soils the constituent parts and minerals are more readily available to plant roots and soil microbes.
Controlled Traffic Farming (CTF)	The practice of using the same tramlines in arable operations year after year to concentrate soil compaction from farm machinery in a small part of the field.
Cover crops	Crops sown which are primarily there to maintain ground cover and provide structural and nutrient benefits to the soil. These differ from catch crops in that they tend to remain through the winter into the spring.
Direct drilling	The practice of using specialist seed drills to plant seeds into uncultivated and undisturbed soils.
Ecosystem	A group of living organisms that live in and interact with each other in a specific environment.
Ecosystem function	The measure of how well an ecosystem is performing in providing the ecosystem services.
Ecosystem services	1. Provisioning (as primary products and food); 2. Regulating (including water and air quality); 3. Cultural (as landscape and wildlife enjoyment, including recreation and wellbeing) and; 4. Supporting services (including biomass production, production of atmospheric oxygen, soil formation and retention, nutrient cycling, water cycling, and provisioning of habitat).
Fallow	The practice of keeping a parcel of land out of production for a period of time.
Farmyard manure (FYM)	Manure produced by housed or semi-housed livestock – particularly during the winter, mixed with the bedding material – usually straw.
Herbal leys	Grazeable non-permanent pasture containing a mixture of grasses and herbs.
Integrated Crop Management (ICM)	A method of farming that balances the requirements of running a profitable business with responsibility and sensitivity to the environment.
Integrated Pest Management (IPM)	An approach to pest control which aims to reduce the use of pesticides and make the most of natural processes to provide pest control.
Integrated Weed Management (IWM)	An approach to weed control which aims to reduce the use of herbicides and make the most of natural processes to provide weed control.
Leguminous leys	Grazeable non-permanent pasture containing a mixture of cereal crops, grasses and leguminous plants intended to provide ground cover and lock up atmospheric nitrogen through plant processes.
Mob grazing	The practice of subdividing grazeable crop fields and pasture into smaller parcels between which livestock are moved on a regular (daily or twice daily) basis. This is intended to mimic natural grazing methods to enable soil organic matter to build up over time. Livestock should not overgraze pasture in this system. Their movement should enable them to graze 1/3, trample 1/3 and leave 1/3 of the available biomass.
Mycorrhizal fungi	The species or group of species of fungi which form symbiotic relationships with the roots of plants that enable a greater take up of soil nutrients and water by plants. These are very vulnerable to agricultural sprays and soil disturbance.
Natural capital	These are the stock of natural assets which provide ecosystem services. As the value of a service to people increases, the natural capital asset increases in value.
Overgrazing	When pasture is grazed beyond its ability to recover and provide benefits to the soil. This can cause poaching and soil compaction and a reduction in soil health.

Over-wintered stubble	Arable land on which the crop (usually a cereal) has been harvested and then left uncultivated until the spring.
Overseeding	The practice of introducing new species to pasture by broadcasting or direct drilling seed into undisturbed pasture.
Ploughing	The use of farm machinery to fully invert the top soil and bury trash/plant matter. It is done as a method of creating a good seed bed on which to drill crops.
Reduced tillage	A method of creating a seedbed with less soil disturbance than ploughing.
Reseeding pasture	The practice of cultivating pasture in order to destroy the existing mix of grasses to introduce a fresh crop or combination of grass species.
Slot-seeding	A method of sowing grass without inverting the soil. The new seeds are sown into slots cut into the soil.
Soil health	The term to describe the status of a soil in terms of its mineral, nutrient, animal, microbial, and structural condition.
Soil microbes	The microbes that exist in soil.
Soil Organic Carbon (SOC)	The quantity of carbon held in soil in the form of organic matter, soil microbes, and other soil life. This tends to be calculated as a function of soil organic matter (SOC tends to be 58% of SOM in terms of weight per unit of soil mass).
Soil Organic Matter (SOM)	The organic component of soil, consisting of three primary parts including small (fresh) plant residues and small living soil organisms; decomposing (active) organic matter; and stable organic matter (humus).
Soil structure	A healthy soil should have a multitude of gaps, tunnels, and air spaces through which water, oxygen, carbon dioxide and animals can travel. Compacted soil has poor soil structure.
Subsoiling	The practice of using farm machinery to shatter deeply buried soil compaction – usually done to improve water infiltration.
Temporary leys	Crops grown, often in an arable rotation (but not exclusively), which can be grazed by livestock and tend to provide a particular benefit to the soil health.
Undersowing	The practice of broadcasting or sowing seeds into a standing arable crop to ensure that the new crop will be already established at the point of harvest of the previous crop, thus preventing the soil from being bare immediately after harvest.
Volunteers	The remnant seeds which germinate in stubble or cultivated ground which are there as a result of having been dropped by the combine harvester.
Zero tillage	The practice of no soil disturbance in arable crop production (although sometimes it does include subsoiling).

9. CONTACT US

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