OF&G Policy Paper

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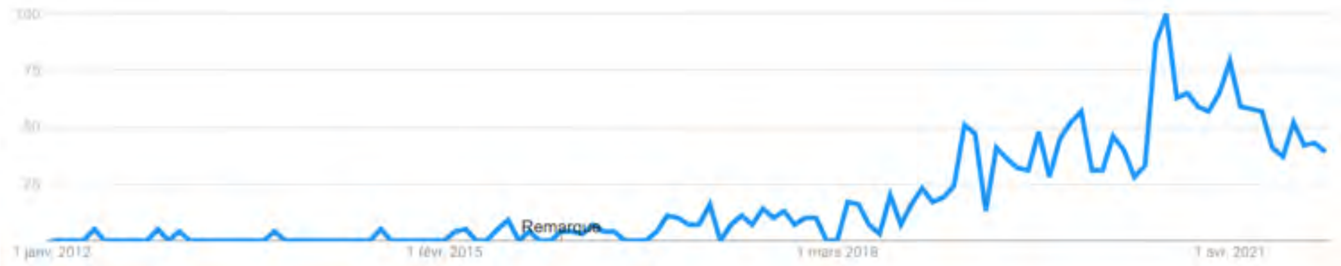
Organic: the benchmark for advanced regenerative farming

There is a new 'buzz word' being championed by numerous industry stakeholders and influencers – regenerative agriculture. Regenerative agriculture seeks to capture atmospheric carbon dioxide by growing plants that move carbon dioxide into the soil mostly through 'no-till" and/or "reduced till" practices and permanent perennial pastures and grasslands.



Results of Google Trends search of the words "regenerative agriculture" from the 1 January 2012 to the 1 January 2022

There are several individuals, groups, and organizations that have attempted to define the principles of regenerative agriculture. In their review of the existing literature on regenerative agriculture, researchers at Wageningen University created a database of 279 published research articles on regenerative agriculture[1]. Their analysis of this database found that people using the term regenerative agriculture were using different principles and practises to guide their interpretation.

While there are some excellent regenerative initiatives, the lack of clarity around a regenerative approach is worrying. It means potentially hazardous synthetic fertilisers, harmful synthetic biocides, and genetically modified or engineered crops with potential risks to ecosystems and to rural economies may all be used. Furthermore, animal welfare may not always be prioritised. In sharp contrast, organic's legally binding production standards already clearly enshrines the best of regenerative agriculture's principles.

Over seventy years organic production has focused on strengthening the health of soils; increasing biodiversity; improving the water cycle; and increasing resilience to climate change. Organic farming continues to reconnect humans with nature's rhythms and ecosystems and has regenerated natural landscapes while providing us with nutritious food.

OF&G believe in the need for a holistic and multi-dimensional approach to soil health and biodiversity enhancement. Organic focuses not only on the amount of carbon stored in soils, but also on biodiversity protection, which requires a systemic transition of the farming system.

Organic producers already undertake regenerative practises, day in day out as they implement a clear and legally binding organic production standard. Organic farmers and businesses within the supply chain are annually audited for compliance. OF&G believe that there is no appetite or need to add to the regulatory burden with additional substantiation of so-called regenerative methods.

In the UK, organic farming is advanced regenerative. OF&G believe the organic sector should communicate the already substantiated regenerative nature of organic production more openly and effectively.

This is not simply hubris: organic management shows a proven positive impact on soil-based greenhouse gas emissions and soil health. On average the climate protection performance of organic results in 1082 kg CO_2 equivalent per hectare per year, due to lower GHG emissions and increased carbon sequestration in soils[2]. This is the outcome of the organic 'regenerative' principles and practises detailed in organic standards:

1 https://www.sciencedirect.com/science/article/pii/S2211912420300584?via%3Dihub

2 *Sanders, J. and Heß, J. (eds), 2019. Leistungen des ökologischen Landbaus für Umwelt und Gesellschaft. 2. überarbeitete und ergänzte Auflage. Braunschweig: Johann Heinrich von Thünen-Institut, 398 p, Thünen Rep 65*

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- **Organic stores more carbon in the soil**

Soil organic matter content in arable soils has been declining across the UK, the main drivers being land management and climate[3]. Many common practices of organic farming help to improve soil quality and fertility and contribute significantly to higher soil organic carbon sequestration compared to land under conventional management. The use of organic fertiliser like composted waste from livestock husbandry, improved crop varieties, crop rotations including legumes, reduced tillage and planting of cover crops contribute to increased carbon storage. A global analysis shows higher soil organic carbon stocks in land under organic management compared to land under non-organic management (by 3.5±1.1 tonnes of carbon per hectare) and to higher annual sequestration rates (up to 0.5±0.2 tonnes of carbon per hectare and year)[4].

- **Mixed farming, including crops and grassland, reduces tillage**

Organic farming systems are characterised by mixed farming, with the inclusion of pasture in a multi-species rotation. This fertility building phase of the organic rotation is an important component of weed, pest and disease control and has a significant impact on the extent of cultivation. Typically, at least 50% of the organic rotational land area will be in fertility building pastures. Thus 50% of the farm is not cultivated at all. The organic approach consequently compares well with non-organic 'minimum-tillage' or 'zero-till systems which require the use of hazardous herbicides and other synthetic pesticides.

- **'Carbon farming' is synonymous with the term organic**

Carbon farming is a whole farm approach optimising carbon capture on working landscapes by implementing practices that are known to improve the rate at which CO_2 is removed from the atmosphere and stored in plant material and/or soil organic matter. Organic principles and practices are explicitly rooted in an understanding of system dynamics and positive feedback processes that make a "regenerative" upward spiral of soil fertility and farm productivity possible.

- **Lower emissions due to avoiding synthetic fertiliser use**

The production, transportation and use of fossil fuel-based fertilisers requires very high energy inputs that significantly contribute to GHG emissions from agriculture. Since synthetic fertilisers are prohibited in organic agriculture the emissions associated with their manufacture and use are avoided when compared to non-organic systems. Studies show that the emission reduction potential by the absence of synthetic fertiliser use is around 20% of the global annual agricultural GHG emissions from agriculture[5]. Instead of being dependent on external fertiliser inputs, organic farming relies on seeking to close nutrient cycles through natural fixation of nitrogen, the recycling of organic manures and minimising nitrogen losses.

Furthermore, the reduced use of synthetic fertilisers (and pesticides) limits the negative impact of agricultural practices on air quality. Organic farming reduces emissions of ammonia, particulate matter, oxides of nitrogen, carbon and sulphur, as well as volatile organic compounds and pathogens, which all have adverse effects on human health

3 *Stolte, J. et al (eds), 2016. Soil threats in Europe. EUR 27607 EN*
4 *Gattinger, A. et al, 2012. Enhanced topsoil carbon stocks under organic farming. Proceedings of the National Academy of Sciences, 109, 18226-18231*
5 *Scialabba, N., and Müller-Lindenlauf, M., 2010. Organic agriculture and climate change. Renewable Agriculture and Food Systems, 25(2), 158-169*

- **No plant protection chemicals**

The use of synthetic plant protection agrochemicals (insecticides, herbicides, fungicides etc.) is prohibited in organic farming so their impact on agricultural ecosystems is removed and biodiversity and soil health are both protected. The production of pesticides requires a considerable use of energy, organic farming avoids the emissions associated with their production. In addition, the avoidance of pesticides improves water quality avoiding the potential detrimental effects on aquatic species. The restricted use of veterinary drugs in organic livestock systems also reduces their impact on water resources.

- **Lower energy input to organic systems**

Organic agriculture bases its production on on-farm natural processes instead of being dependent on external inputs derived from fossil fuel. Nitrogen fixing legumes, such as clover-grass leys and beans, and the use of organic manure, help to build soil fertility and recycle nutrients[6]. Overall, organic agriculture shows a lower energy use per hectare and per unit of product. Studies suggests that around 15% less energy are consumed in organic agriculture per unit produced[7]. A study in Switzerland shows that even though organic farming may use more machinery (for example for mechanical weeding), the energy demand per hectare was 22% -35% lower per year than in non-organic farming, whilst per kilo of harvested dry matter its reduced energy demand ranged from 2% to 17%[8].

- **Lower nitrous oxide emissions from soil**

The use of synthetic fertiliser also contributes to emissions of nitrous oxide. One kilo of N_2O warms the atmosphere about 300 times the amount that a kilo of CO_2 does over a 100-year timescale. Its potency and relatively long life make N_2O a dangerous contributor to climate change[9]. Whilst nitrous oxide from soils can be released in all farming systems, the application of synthetic fertiliser increases the emission from the farm's fields[10]. Studies show a reduction of 40% nitrous oxide emissions per hectare for organic systems when compared to non-organic[11]. Avoiding the use of synthetic nitrogen fertilisers is an effective way of reducing emissions from this source. Nitrate leaching is also shown to be reduced by 28-39% in organically farmed systems.

6 *Sanders, J. and Heß, J. (eds), 2019. Leistungen des ökologischen Landbaus für Umwelt und Gesellschaft. 2. überarbeitete und ergänzte Auflage. Braunschweig: Johann Heinrich von Thünen-Institut, 398 p, Thünen Rep 65*
7 *Scialabba, N. and Müller-Lindenlauf, M., 2010. Organic agriculture and climate change. Renewable Agriculture and Food Systems, 25(2), 158-169.*
8 *Nemecek et al, 2011. Life cycle assessment of Swiss farming systems. I. Integrated and organic farming. Agricultural systems, 104, 217-232*
9 https://insideclimatenews.org/news/11092019/nitrous-oxide-climate-pollutant-explainer-greenhouse-gas-agriculture-livestock/
10 *Sanders, J. and Heß, J. (eds), 2019. Leistungen des ökologischen Landbaus für Umwelt und Gesellschaft. 2. überarbeitete und ergänzte Auflage. Braunschweig: Johann Heinrich von Thünen-Institut, 398 p, Thünen Rep 65*
11 *Skinner, C. et al, 2019. The impact of long-term organic farming on soil-derived greenhouse gas emissions. Scientific Reports, 9:1702*

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- **Reduced emissions from livestock**

Besides nitrous oxide emissions, methane from enteric fermentation is acknowledged as the primary source of the GHG emissions from agriculture, not least because methane has a climate change impact four times greater than carbon dioxide. Organic farming sets clear rules on how many animals are allowed per hectare, with the objective of not exceeding the holding capacity of the land. In addition to reducing methane emissions, this means that fewer animals reduce emissions resulting from livestock, including from manure management. 61% of UK organic land is permanent pasture and meadows, mostly used for grazing organic livestock[12]. Additionally, animals in organic systems are kept outside and allowed to graze as much as possible. Organic regulation also requires 60% of the feed to come from the farm or its region. Use of cattle breeds for both milk and meat that are appropriate to organic feeding and housing regimes can decrease the emission per unit of products derived from ruminants[13]. Ruminants are well suited to organic farming systems.

- **Improved manure management**

Manure management accounts for around 15% of the agricultural GHG emissions[14]. Improved techniques, such as manure composting, often used in organic agriculture, can reduce emissions of nitrous oxide by 50% and of methane by 70%[15]. Reduced emissions from aerobic manure management in organic systems aims to limit methane emissions that are associated with anaerobic processes.

- **Organic supports ecosystem functions, protecting biodiversity, soils and water**

Biodiversity is a vitally important basis for the functioning of many ecosystem processes and functions. For example, the positive impact of organic farming on crop pollination in fruit production increases fruit yield and reduces loss due to misshapen fruit[16]. Organic cultivation increases natural pest control in various cases compared to non-organic cultivation[17].

Soil health is the foundation of organic farming. Several features of a healthy soil, rich in diversity, are observed in soils under organic management, including improved soil structure, soil erosion prevention and flood protection. Organic soils have better soil aggregate stability due to their higher humus content and a higher water infiltration rate (by up to 137%)[18,19].

12 https://www.gov.uk/government/statistics/organic-farming-statistics-2021

13 *IFOAM EU and FiBL, 2016. Organic farming, climate change mitigation and beyond. Reducing the environmental impacts of EU Agriculture*

14 *EEA, 2021. Greenhouse gas emissions from agriculture in Europe*

15 *Scialabba, N. and Müller-Lindenlauf, M., 2010. Organic agriculture and climate change. Renewable Agriculture and Food Systems, 25(2), 158-169*

16 *Andersson, G. et al, 2012. Organic Farming Improves Pollination Success in Strawberries. PLoS ONE 7(2), e31599*

17 *Tuck, S. et al, 2014. Land-use intensity and the effects of organic farming on biodiversity: a hierarchical meta-analysis. Journal of Applied Ecology 51, 746-755*

18 *Siegrist, S. et al, 1998. Does organic agriculture reduce soil erodibility? The results of a long-term field study on loess in Switzerland. Agriculture, Ecosystems and Environment 69, 253-264*

19 *Sanders, J. and Heß, J. (eds), 2019. Leistungen des ökologischen Landbaus für Umwelt und Gesellschaft. 2. überarbeitete und ergänzte Auflage. Braunschweig: Johann Heinrich von Thünen-Institut, 398 p, Thünen Rep*

Consequently organic soils are better protected against erosion resulting from heavy rainfall. Soil erosion and soil loss were 22% and 26% lower respectively in organic farming compared to non-organic[18].

Soils on organic farms mineralise 30% more nitrogen from a green manure during drought than soils from non-organic farming[20]. The rich biodiversity present in soils under organic management results in active soil life and a diverse range of beneficial fungi which together can reduce pathogens and pests in soils[21,22]. Organic farming has the potential to protect ground and surface-water from pollution by fertilisers and pesticides.

Summary

Fundamentally, organic is advanced regenerative agriculture. In the face of significant climate and biodiversity challenges, organic provides a holistic and multi-dimensional approach that delivers tangible benefits. Not only that, the legally binding organic standards also already enshrine regenerative principles. Currently there is no other formal standards based framework for regenerative agriculture.

It is essential that our focus and intent remains razor sharp. A proliferation of schemes under the guise of 'regenerative' will add confusion. The government's consistent failure to embed organic within evolving policy is evidence of this.

The **OF&G Organic Manifesto** presents a clear case for organic to be included in agriculture policy. This paper sets out how organic offers a regenerative system because of:

- Organic stores more carbon in the soil
- Mixed farming, including crops and grassland, reduces tillage
- 'Carbon farming' is synonymous with the term organic
- Lower emissions due to avoiding synthetic fertiliser use
- No plant protection chemicals
- Lower energy input to organic systems
- Lower nitrous oxide emissions from soil
- Reduced emissions from livestock
- Improved manure management
- Organic supports ecosystem functions, protecting biodiversity, soils and water

Effectively tackling environmental issues requires a clear, consolidated and systematic approach such as organic.

There is a clear and undisputed correlation between organic and regenerative in terms of practices, outputs, impact and intent. Organic sets benchmark standards for advanced regenerative farming and deserves acknowledgement as such.

Relevant text and references in this document are used with the permission of IFOAM OE.

20 *Lori, M. et al, 2018. Distinct nitrogen provisioning form organic amendments in soil as influenced by farming system and water regime. Frontiers in Environmental Science, 1-14*

21 *Mäder, P., et al, 2002. Soil fertility and biodiversity in organic farming. Science 296, 1694-1697*

22 *Klingen, I. et al, 2002. Effects of farming System, field margins and bait insect on the occurrence of insect pathogenicfungi in soils. Agriculture, Ecosystems and Environment 91, 191-198*

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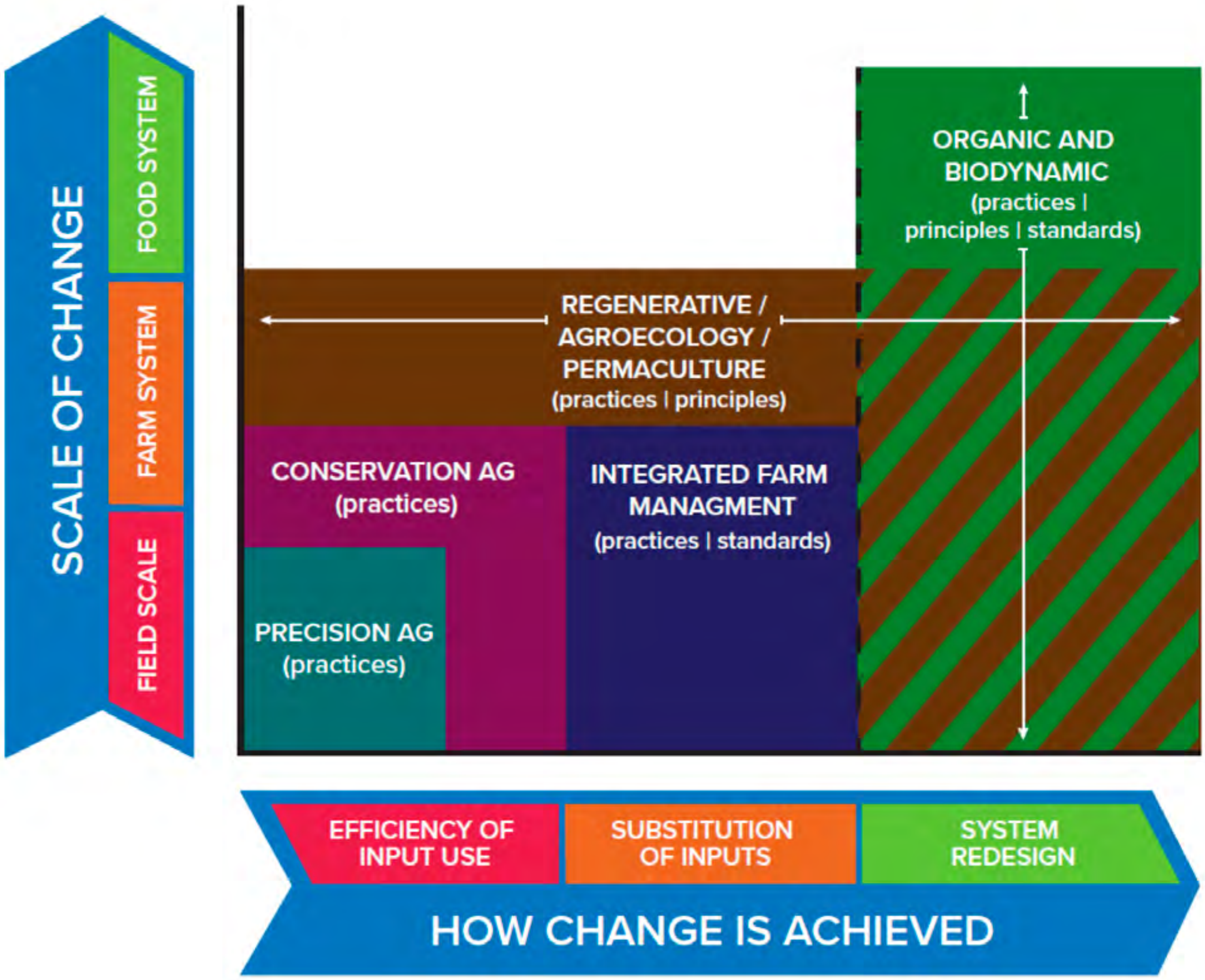
OF&G has developed the following farming systems graphic to highlight how organic delivers the best of advanced regenerative agriculture, in terms of scale and extent of change delivered.



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