Biodynamic farming

and solutions it offers to the problems of climate change

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Biodynamic farming is almost 100 years old. It was the first form of sustainable farming system to arise in response to the industrialisation of agriculture. It is one of the highest performing farming systems in respect to climate change and has a great deal to offer farmers and policy makers trying to understand how to produce enough food for an increasing population, whilst reducing carbon emissions from farming to net zero, sequestering carbon whilst adapting to the increasingly erratic weather patterns.

Current food production systems contribute approximately 30 percent of our total carbon emissions in the global north.[1]

Carbon emissions in farming come from;

1. The use of fossil fuels for tractors,
2. Nitrogen-based fertilisers and pesticides
3. Methane produced by cows,
4. Transport and refrigeration of food all around the world
5. Unseasonal production of food
6. Plastic packaging required for long distance travel.

To put this in a context, we all know that we can go to a supermarket and expect to buy, for instance non organic French Beans wrapped in plastic, in January flown in from Kenya, We also know that the increasing fashion to eat more beef across the world in the transition economies has created huge "feedlots" or sheds full of cattle, in countries for example like China, that are fed with soya imported from the cleared rainforests of the Amazon. All grown using tractors, fertilisers and pesticides. This epitomizes the major fault lines in industrial farming and how it contributes towards climate change.

We are now experiencing Climate change in real time, with extreme weather events, high rainfall, high wind, late frosts, warm spells in winter, drought and very high temperatures in the summer.

The manufacture of nitrogen fertilisers and pesticides requires a lot of energy and have "embedded carbon" that comes with their use. Nitrate fertilisers also produce nitrous oxide, a greenhouse gas far more potent than Carbon dioxide. Cattle in industrial farming produce more methane than grass fed cattle, and methane itself is a far more potent greenhouse gas than carbon dioxide. A recent study by Chatham House showed that worldwide livestock production is responsible for 15 percent of worldwide carbon emissions, the same as the tailpipe gases from vehicles.[2]

We are now experiencing Climate change in real time, with extreme weather events, high rainfall, high wind, late frosts, warm spells in winter, drought and very high temperatures in the summer. Farming by its very nature relies on predictable weather patterns. For instance in 2019 the wettest winter on record prevented some of the sowing of the winter wheat crops in the UK. Spring wheat went in instead, but then the wettest August on record in 2020 made the harvesting of the wheat almost impossible, with predictions of the overall wheat harvest in the UK down by 30 percent.

Target carbon emissions reduction have been set by the International Panel on Climate Change (IPCC) at the Paris COP in 2015 and ratified by most of the world's countries. The current aim is to reduce emissions by 100 per cent by 2050, in order to keep the global temperature increase to a sustainable level set at two degrees Celsius. The NFU has suggested farming in the UK should aim for net zero carbon emissions

Marina O'Connell (centre) speaking with visitors
Picture credits: Apricot Centre, Huxhams Farm

by 2040, and Extinction Rebellion suggests 2030. To achieve this target in 10-20 years the time to start creating low carbon resilient farms is in fact NOW.

From a farming and growing perspective solving the challenge of climate change is approached from two directions mitigation and adaption. Farming systems can **mitigate** climate change by changing farm practices to reduce carbon emissions and at the same time sequester carbon into soils and trees. Farms can potentially soak up more carbon than they produce becoming "carbon positive". Farming systems will also have to **adapt** to climate change by change of practice, to become more resilient and productive whilst coping with extreme and changeable weather patterns.

Biodynamic farming is one of the most highly functioning farming systems that can both mitigate and adapt to climate change at the same time.

Mitigation of Climate change

Biodynamic farming methods mitigate climate change by sequestering more carbon in the soils than industrial farming methods.

The lesson that Biodynamic farms can offer is a systems rethink for the industrial model.

Research at FIBL (Federal Institute of Biological Agriculture Switzerland) has found that organic farms sequester two tonnes of carbon dioxide per hectare in their soils per year. Biodynamic farms sequester carbon at a 25 percent higher rate than organic farms.[3] This is because Biodynamic soils have a higher amount of humus in them that soaks up and stores carbon. Yatesbury Biodynamic farm in Wiltshire, has completed a carbon audit with the Farm Carbon Toolkit and found that their soil carbon is growing at a rate of 0.27 percent per year, and that, they with the help of their cattle, are sequestering 10 times as much carbon as they are emitting.[4]

Biodynamic soils have this extraordinary capacity to sequester carbon because of the biodynamic preparations that possibly inoculate the soil with a very high diversity of soil microbes, and therefore have high levels of resilient microbial activity. It is this that is transforming the organic matter into humus that can soak up carbon from the atmosphere.[5] Industrial farmers might well ask Biodynamic farmers how they achieve their incredible results of sequestering carbon so well. The lesson that Biodynamic farms can offer is a systems rethink for the industrial model.

Biodynamic farms are designed to become an "organism" or to be as 'closed loop' as possible. They have pioneered creating their own source of nutrition, pest and disease control, and weed control in house rather than using pesticides and fertilisers. Biodynamic farms use green manures and livestock for fertility, functional biodiversity for pest control, crop timing, crop diversity, and mechanical weeding methods to produce local seasonal delicious food. These methods all reduce the dependence on inputs from outside the farm with the embedded carbon and energy that this entails for nitrate fertilisers and pesticides.

Policy makers might well ask Biodynamic farmers how they can produce enough food whilst adapting to climate change. Another system rethink Biodynamic farms have pioneered is the concept of

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community supported agriculture. (CSA). This system allows for customers to pay a weekly subscription and receive a bog of produce from the farm chosen by the grower and not the customer, so sharing the economic risk of crop failures and the gluts of other produce. Supplying customers directly with local, seasonal delicious food directly via the CSA model reduces plastic packaging, transport, cold storage supply chains and food waste as the customers are happy to take slightly mis-shaped produce, often being mixed farms the grade-outs are fed to livestock. The increased diversity of the cropping plan on the farm to supply food in this way also improves the resilience of the farm to climate change weather events. If it's a challenging year for carrots it is probably a good year for tomatoes.

A key aspect of the Biodynamic farm organism is cattle, and these are frequently cited as a major cause of climate change. However Biodynamic cows are pasture fed, and not grain fed, and no nitrogen fertilisers are used. At low stocking rates when grazed on deep rooted meadows they contribute towards the building of organic matter and fertility in the soil and their manure feeds the soil microbes increasing the humus content of the soil. Patrick Holden (Sustainable Food Trust and Patron of the BDA) points out that small mixed farms build fertility by growing grass leys and grazing these by cattle. This system replaces the carbon lost in the years when the soil is used for growing arable or vegetable crops. Permanent pasture stores a great deal of carbon, third highest after forests and wetlands. Biodynamic farms excel at these rotations.

Trees also sequester carbon, Biodynamic farms on principle put down at least 10 per cent of their farmland into biodiversity, often in the form of hedgerows or small woodlands. These can sequester four tonnes of carbon per year per hectare.

The mindset of a Biodynamic farmer is to make every effort to be sustainable, and will often invest in renewable energy on the farm, installing PV panels on a roof of a barn for instance, or installing rainwater harvesting systems for irrigation water.

The big picture is that organic and biodynamic require 20 percent less energy to produce the same unit of yield as the industrial model of farming as proved by research at FIBL.[5]

Adapting to Climate change

Biodynamic soils are resilient to extreme weathers caused by climate change. The high levels of organic matter and hums in the soils means that Biodynamic soils behave like sponges, soaking up excessive rainfall, holding on to it, releasing it slowly. This helps reduce flooding and soil erosion. It also means in a drought it will hold on to water longer so that less irrigation is required, or crop yields remain high.

Biodynamic farms also choose to use open pollinated seeds and varieties, some of the grain crops chosen are populations or genetically diverse races of crops. This genetic diversity also lends resilience to the crops in extreme weather situations.

Huxhams Cross Farm was set up five years ago in partnership with the Biodynamic land trust with the aim to be resilient to climate change and to be carbon positive in the long term, amongst other things. We have transformed our soil using deep rooted green manures and Biodynamic preparations, and key line ploughing. We have planted thousands of agroforestry trees along the contours to improve water retention and sequester carbon. We have installed large scale rainwater harvesting systems for our irrigation, and PV panels to power our cold stores. We are producing small scale local grains and flour, eggs, fruit and vegetables all sold within a 20 mile radius. We are just about coping with the wild weather of 2020, and during lockdown saw our sales increase by a multiple of four as people craved a secure source of healthy nutritious food. We grow YQ populations wheat, this stands for Yield and Quality and is an "out bred" form of population wheat that is very genetically diverse. We sowed it in October 2019, and it withstood the wettest winter on record, with no pest or disease issues, it ripened up and was harvested just before the deluge in August, and we had exactly the same yield as all the previous years. We will be completing a study over the next 6 months to pull together our carbon figures with the "Farm carbon tool kit" and our social impact in partnership with CAWR at Coventry University.[6]

1. J. Pretty Agri-culture Earthscan, London, 2002
2. L. Wellesley C. Happer, A Froggatt "Changing Climate, Changing diets" Chatham House Report 2015
3. soil association report 2009, Soil carbon and organic farming **www.soilassocation.org**
4. **https://yatesbury.webs.com/**
5. **https://www.fibl.org/en/themes/soil-info/soil-background.html**
6. Apricot centre Huxhams cross farm **www.apricotcentre.co.uk**