

The Farm as an Ecosystem

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An ecosystem is a community of plants and animals which coexist with water, soil and sun. But how can these elements be combined in a farming system which is primarily concerned with the need to produce both food and profit? While ecosystems are protected in the likes of SSI's and wildlife reserves, we must remember that the vast majority, 75%, of land in the UK, is farmland.

Historically the needs of agriculture and biodiversity were diametrically opposed. Intensification and the use of monocultures which are dependent on the long term use of fertilisers and pesticides have damaged farmland ecosystems, causing soil degradation and destroying habitats.

But many farmers are now looking to move away from this system of farming. The increasing cost of inputs means that their income has fallen and the uncertainty of support payments has given further impetus for change. The reliance on monoculture and chemicals is no longer viable for many farmers who are increasingly looking for a self-sufficient system of low cost farming designed to reduce the need for costly fertilisers and pesticides and add value to commodity foods like oats, wheat and milk and meat.

So there's a real opportunity here, to develop and promote a sustainable farming system for the future, which supports farmers' livelihoods, food production, AND the environment.

Soil

Healthy, productive farmland and a healthy ecosystem start from exactly the same place - from healthy soil, in other words, soil with an abundance of living organisms, organic matter, and with the capacity to hold more water. This can either be nurtured or damaged through agricultural practices. While monocultures have stripped much of the fertility from the soil, it can be restored through by growing complex grass/legume/herb mixtures in diverse rotations. These not only improve soil health but enhance animal health and ultimately human health, through the food chain.

This type of rotation typically begins with a 4 year deep rooting diverse or 'herbal' ley, made up of many different species, each with its own growth habits and biology, which benefit the soil, the farmer and the ecosystem in as many ways.

Red clover, for instance, has a deep root structure and can fix nitrogen into the soil while herbs like chicory provides an even deeper root, mining the soil for minerals including potassium, copper, selenium, making them available to animals and ultimately to humans.

Mixes containing sainfoin, birdsfoot trefoil and chicory are also anthelmintics (natural wormers), saving the farmer money every year. And the growing times of the different plants also have the great advantage of providing year round forage. Once established, they can be managed by a sheep flock or a herd of cattle in a mob grazing system, which further boosts diversity and soil health. A win-win.

Mob-Grazing, sometimes referred to as cell-grazing, is a term used to describe a method of grazing and frequently moving livestock systematically around a field to graze different sections in rotation. It's based around the concept of allowing a large number of animals to graze a small area, allowing a diverse sward to grow to a significant height and moving the animals at regular intervals. Livestock are usually moved daily and are excluded by back-fencing from the area they have just grazed, allowing it to regrow. It's an alternative to set stocking and rotational grazing that is dependent on maximising the production of a grazing animal. It goes hand-in-hand with growing diverse leys and is fundamental to soil improvement. Animals eat about a third and what they don't

eat they trample or leave, which means that it's unlikely for any plant species to become dominant and the sward remains diverse. This trampled forage is continually returned to the soil surface as organic matter, helping to feed the soil.

The use of bi-cropping, cover cropping and green manuring can add further diversity into rotations.

Research in the UK, US and Australia has shown that the available mineral content of the soil has been seriously depleted over the past decades, affecting their presence in vegetables, fruit, meat and milk, so the link between farming to produce healthy soil which enters the food chain and produces healthy food is becoming increasingly important. Deep rooting grass/legume/herb leys especially when grazed can make these minerals more available.

Water

As well as offering carbon capture, the deep rooting crops in a diverse grass ley also improve water infiltration. Water on the farm is essential for all living elements and lack of it is the limiting factor when growing any crop. So once again the need for a basic element of biodiversity goes hand in hand with farming requirements.

Water can either be held on a farm, in the soil, as a resource, or lost through runoff or evaporation. And the way to retain it is with better structured soil and more organic matter.

The tap roots of chicory and some legumes in diverse leys can break through soil pans, improving soil structure and assisting drainage. A distinctive difference between a simple monoculture or grass only ley and a herbal ley is the latter's ability to withstand dry summers. The fibrous roots of grasses like cocksfoot and Timothy in the herbal ley are able to reach many feet through the soil. Alongside these, the long tap roots of many legumes also go down deep, drawing moisture from below where the shallow-rooted grasses can't reach.

Essentially, soil organic matter acts like a sponge, soaking up and trapping excess water. And it's extremely beneficial to have the 'natural capital' of water on the farm.

We've taken this a step further and maximised this at our farm, Honeydale, with an innovative flood management scheme. This project involved capturing spring water and slowing its escape downhill to help reduce the likelihood of flooding along the Evenlode Valley (part of Upper Thames Tributary) and also create a wetland habitat for wildlife. Simply put, the principle is to capture the flow upstream to prevent flooding further downstream and one of the aims is to provide a small scale demonstration of how a watercourse can be improved to reduce runoff and erosion. The scheme created several small leaky dams known as attenuation bunds, connected by short lengths of meandering channel. Water is held back by the bund until the level reaches a perforated stone dam. Once this has been breached the water runs onto the next dam, repeating the process. Once water over-tops the final dam it is collected in a shallow scrape where excess will drain away into the subsoil.

The second part of this project involved planting the final water holding area with half a hectare of trees to form an infiltration zone. As the tree roots develop over time they create preferential pathways for water to infiltrate into the subsoil.

Techniques like these can make a real difference to reducing flooding and also have multiple benefits in terms of reduction of nutrient and sediment runoff to rivers and increased carbon capture.

Trees

Farmers are increasingly exploring the many ways in which trees can benefit agriculture in terms of shelter, moisture and biodiversity, as so-called 'agroforestry' becomes more mainstream.

Rows of trees or alleys planted in big open fields, with environmental grass seeds - wildflower and pollen and nectar mixes- grown under the trees, create wildlife refuges and habitats which attract predatory insects to reduce the need for pesticides and also provide for pollinators.

Grazing animals will use the trees as shelter all year round. The large root structure of trees is also very valuable for soil protection and water infiltration and for lifting nutrients which enter the leaves and are then returned to the soil when the leaves fall.

Pollinators

Plants for pollinators need not be confined to margins or strips however. Red clover is a feature of diverse seed mixtures, for instance, and provides for bees and other pollinators, while species such as sainfoin are seeing a resurgence in favour due to the benefits it brings to livestock and the environment by improving the efficiency of protein digestion of grass in the rumen of the cow, preventing bloat, worm infections, and reducing methane emissions. Bees love it, and it is renowned for producing the best-tasting honey.

The farm as an ecosystem will have a diversity of animals, trees, crops, grassland, pollinators and birds, soil and water, driven by photosynthesis, and all working in harmony together to produce a resilient, sustainable system for the farmer, turning sunshine into Sunday dinner.

But there is a barrier.

What we desperately need is a food processing system that supports all this. Farmers have little access to direct routes to market their products and are reliant on large scale, centralised and industrialised food processing systems. The wide scale adoption of highly diverse farming systems, which will naturally produce smaller quantities but of more varied crops and livestock products, depends on having access to smaller local or regional food distribution networks. Farmers need support from the market and the share and exchange of knowledge. Social entrepreneurship, with a shorter local supply chain which considers the needs of consumers and the farmers who produce their food, is crucial.

Provided this barrier can be overcome, UK farms, of which there are many tens of thousands, can offer huge areas of biodiversity.

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