



The rise and fall of monoculture farming

By growing just one crop species in a field at a time, monocultures enable farmers to use machinery, increasing the efficiency of activities like planting and harvesting. But despite supplying the lion's share of the world's food, monocultures are amongst the most controversial features of today's agriculture.

13 December 2021 - By ALLISON BALOGH

Raising a single crop has drawbacks as it increases the risk of disease and pest outbreaks because monocultures lack other plant and animal species that limit the spread of disease and control pests through predation.

This means larger amounts of pesticides and herbicides, which can pollute rivers and streams, are needed compared to more diverse farming systems. Intensive use of agricultural chemicals also diminishes the amount of worms and insects available to birds as food.

Growing the same crop year after year reduces the availability of certain nutrients and degrades the soil. Monocultures may therefore also lead to soil exhaustion when the soil becomes depleted of these nutrients.

Although lost nutrients can be replaced using chemical and organic fertilisers, it is expensive to do so. There is also an environmental cost, increased mechanisation has led to greater fossil fuel use and more greenhouse gas emissions.

Considering that monocultures can result in soil degradation, reduced biodiversity and increased economic risk for European farmers, why do they continue to be so pervasive?

How it all began

Frank Uekötter, professor of environmental humanities at the University of Birmingham, United Kingdom, and coordinator of the [MaMoGH](#) project, thinks he might have found the answer. Monocultures, he says, fulfil the following three criteria: they are large, focus on a single product, and cater to distant markets.

‘A couple of centuries ago, farmers produced multiple crops to feed their families and maybe put aside some surplus as a safeguard for the coming year. Only if they had an outstanding harvest were they able to sell some of their product,’ he explained.

‘Monoculture emerged as access to much larger distant markets made it increasingly profitable to specialise. Specialisation meant more efficient planting and harvesting, fewer types of expensive equipment, fewer labourers with specialised knowledge of individual crops, and strengthened knowledge of one value chain and commercial market, including all its regulations and tariffs,’ he added.

Increased efficiency means increased productivity and profit. Importantly, government subsidies have also favoured the monoculture system.

One ‘culture’ fits all – or does it?

Traditionally, farmers practiced crop rotation, whereby different crops were grown in succession on the same area of land to preserve the soils productivity. However, after 1945 monoculture became increasingly prevalent and now supplies not only most of our food but also a significant share of non-food crops like cotton.

‘Since monoculture has evolved all over the world, you would think there’s a vision behind it, but, in fact, this may be the greatest experiment that humans have conducted without a clear blueprint,’ noted Uekötter.

Nevertheless, farmers have a lot invested in monoculture – both financially and emotionally – and it has generally worked well for them. But that may not be the case for much longer.

Farming, once one of the most natural of endeavours, has become ‘artificialised,’ claims Raul Zornoza Belmonte, an expert on sustainable land use and crop diversification and professor of agricultural engineering at Universidad Politécnica de Cartagena, Spain.

‘This globalised capital, chemical and energy-intensive sector is having a negative impact not only on the environment in terms of loss of biodiversity, soil health and greenhouse gas emissions but also on farm productivity and expenses,’ he explained.

Diversity is the key

Through the [Diverfarming](#) project, Zornoza and his team have tackled these challenges by creating a free web-based decision support tool to provide tailor-made solutions, and guidelines for diversified cropping systems. This app also includes a toolbox for adapting the different agricultural activities and even a new prototype of an improved machine for tilling the soil.

Diverfarming’s community of ‘diverfarmers’ implemented these tools and is now enjoying the benefits. ‘In vineyards and orchards, organic farmers have introduced herbs like thyme and oregano alongside or between the main crops. This has reduced the weeds and their expensive and time-consuming removal, and with the same labour, instead of weeds, farmers now have fresh-cut herbs that can be sold as they are or from which their essential oils can be extracted and sold,’ said Zornoza.

‘Aromatic herbs and their beautiful flowers attract beneficial insects – and potentially agritourists, a boon for rural tourism – while increasing soil quality and nutrients and enhancing water retention, and with no effect so far on the quality or production volume of fruits or wine,’ he added.

But the advantages of growing different crops together don't stop here, the practice can also limit erosion, improve the storage of soil carbon and reduce the amount of nitrogen in water. It also provides home to a much greater range of life both below the soil and above from tiny microbes and creepy crawlies to reptiles, birds and mammals.

The (informed) customer is always right

This message has been picked up in Italy, where Diverfarming is working with a major food company, rotating crops of wheat and tomatoes with the aid of a modified business model. Undoubtedly, getting major companies on board is a tremendous advertisement to other companies, farmers and consumers. Such buy-in will likely also help multiply awareness of the gains that crop diversification can bring.

'Companies enhance their image with increasingly savvy consumers who demand that their products are sourced sustainably and with respect for the environment. Meanwhile, farmers see that large companies are interested in buying their greener products,' explained Zornoza.

Consumers are now driving changes in policy and farming practices with Diverfarming surveys showing that they are willing to pay more for sustainably sourced foods. We increasingly want to know where our food comes from, how it is produced, and even the supply chain carbon footprint, and farmers see there is a growing market, encouraging them to make the change.

Getting connected

Diverfarming is a founding member of the [Crop Diversification Cluster](#), which began with six EU-funded projects in Europe and is still growing. For example, a recent recruit in Canada will be instrumental in developing a specialised platform to harmonise the regulatory systems in North America and Europe that will help spread best practice in crop diversification.

As Zornoza explained, 'we created the cluster to last beyond the individual projects, to connect European Commission and international policymakers, farmers and researchers and increase the impact of crop diversification research and innovations across the agri-value chain.'

Zornoza and his team have shown a return-on-investment time of about 5 years to recover the costs of new machinery, irrigation systems and personnel training. He emphasises that change is slow and farmers need time to adapt as well as financial support. But with policymakers, farmers and consumers around the world setting the bar high, the great farming transition has all the ingredients to succeed.

The research in this article was funded by the EU. If you liked this article, please consider sharing it on social media.

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