"10 reasons why organic can feed the world"

Can organic farming feed the world?
Ed Hamer and Mark Anslow say yes, but we must farm and eat differently.

1. Yield

Switching to organic farming would have different effects according to where in the world you live and how you currently farm.

Studies show that the less-industrialized world stands to benefit the most. In southern Brazil, maize and wheat yields doubled on farms that changed to green manures and nitrogen fixing leguminous vegetables instead of chemical fertilisers.[1] In Mexico, coffee-growers who chose to move to fully organic production methods saw increases of 50 per cent in the weight of beans they harvested. In fact, in an analysis of more than 286 organic conversions in 57 countries, the average yield increase was found to be an impressive 64 per cent. [2]

The situation is more complex in the industrialized world, where farms are large, intensive facilities, and opinions are divided on how organic yields would compare.

Research by the University of Essex in 1999 found that, although yields on US farms that converted to organic initially dropped by between 10 and 15 per cent, they soon recovered, and the farms became more productive than their all-chemical counterparts.[3] In the UK, however, a study by the Elm Farm Research Centre predicted that a national transition to all-organic farming would see cereal, rapeseed and sugar beet yields fall by between 30 and 60 per cent.[4] Even the Soil Association admits that, on average in the UK, organic yields are 30 per cent lower than non-organic.

So can we hope to feed ourselves organically in the British Isles and Northern Europe? An analysis by former Ecologist editor Simon Fairlie in The Land journal suggests that we can, but only if we are prepared to rethink our diet and farming practices.[5] In Fairlie's scenario, each of the UK's 60 million citizens could have organic cereals, potatoes, sugar, vegetables and fruit, fish, pork, chicken and beef, as well as wool and flax for clothes and biomass crops for heating. To achieve this we'd each have to cut down to around 230g of beef (½lb), compared to an average of 630g (1½lb) today, 252g of pork/bacon, 210g of chicken and just under 4kg (9lb) of dairy produce each week – considerably more than the country enjoyed in 1945. We would probably need to supplement our diet with homegrown vegetables, save our food scraps as livestock feed and reform the sewage system to use our waste as an organic fertilizer.

2. Energy

Currently, we use around 10 calories of fossil energy to produce one calorie of food energy. In a fuel-scarce future, which experts think could arrive as early as 2012. Such numbers simply won't stack up. Studies by the Department for Environment, Food and Rural affairs over the past three years have shown that, on average, organically grown crops use 25 per cent less

energy than their chemical cousins. Certain crops achieve even better reductions, including organic leeks (58 per cent less energy) and broccoli (49 per cent less energy). When these savings are combined with stringent energy conservation and local distribution and consumption (such as organic box schemes), energy-use dwindles to a fraction of that needed for an intensive, centralized food system. A study by the University of Surrey shows that food from Tolhurst Organic Produce, a smallholding in Berkshire, which supplies 400 households with vegetable boxes, uses 90 per cent less energy than if non-organic produce had been delivered and bought in a supermarket.

Far from being simply 'energy-lite', however, organic farms have the potential to become self-sufficient in energy – or even to become energy exporters. The 'Dream Farm' model, first proposed by Mauritius-born agro scientist George Chan, sees farms feeding manure and waste from livestock and crops into biodigesters, which convert it into a methane-rich gas to be used for creating heat and electricity. The residue from these biodigesters is a crumbly, nutrient-rich fertilizer, which can be spread on soil to increase crop yields or further digested by algae and used as a fish or animal feed.

3. Greenhouse gas emissions and climate change

Despite organic farming's low-energy methods, it is not in reducing demand for power that the techniques stand to make the biggest savings in greenhouse gas emissions.

The production of ammonium nitrate fertilizer, which is indispensable to conventional farming, produces vast quantities of nitrous oxide – a greenhouse gas with a global warming potential some 320 times greater than that of CO2. In fact, the production of one ton of ammonium nitrate creates 6.7 ton of greenhouse gases (CO^2e), and was responsible for around 10 per cent of all industrial greenhouse gas emissions in Europe in 2003.[6]

The techniques used in organic agriculture to enhance soil fertility in turn encourage crops to develop deeper roots, which increase the amount of organic matter in the soil, locking up carbon underground and keeping it out of the atmosphere. The opposite happens in conventional farming: high quantities of artificially supplied nutrients encourage quick growth and shallow roots. A study published in 1995 in the journal Ecological Applications found that levels of carbon in the soils of organic farms in California were as much as 28 per cent higher as a result.[7] And research by the Rodale Institute shows that if the US were to convert all its corn and soybean fields to organic methods, the amount of carbon that could be stored in the soil would equal 73 per cent of the country's (would-be) Kyoto targets for CO^2 reduction.[8]

Organic farming might also go some way towards salvaging the reputation of the cow, demonised in 2007 as a major source of methane at both ends of its digestive tract. There's no doubt that this is a problem. Estimates put global methane emissions from ruminant livestock at around 80 million ton a year,[9] equivalent to around two billion ton of CO^2,[10] or close to the annual CO^2 output of Russia and the UK combined.[11] By changing the pasturage on which animals graze to legumes such as clover or birds foot trefoil (often grown anyway by organic farmers to improve soil nitrogen content), scientists at the Institute of Grassland and Environmental Research believe that methane emissions could be cut dramatically. Because the leguminous foliage is more digestible, bacteria in the cow's gut are less able to turn the fodder into methane. Cows also seem naturally to prefer eating birdsfoot trefoil to ordinary grass.

4. Water use

Agriculture is officially the most thirsty industry on the planet, consuming a staggering 72 per cent of all global freshwater at a time when the UN says 80 per cent of our water supplies are being overexploited.[12 &13]

This hasn't always been the case. Traditionally, agricultural crops were restricted to those areas best suited to their physiology, with drought-tolerant species grown in the tropics and water-demanding crops in temperate regions.[14] Global trade throughout the second half of the last century led to a worldwide production of grains dominated by a handful of high-yielding cereal crops, notably wheat, maize and rice. These thirsty cereals – the 'big three' – now account for more than half of the world's plant-based calories and 85 per cent of total grain production.[15]

Organic agriculture is different. Due to its emphasis on healthy soil structure, organic farming avoids many of the problems associated with compaction, erosion, salinisation and soil degradation, which are prevalent in intensive systems.[16] Organic manures and green mulches are applied even before the crop is sown, leading to a process known as 'mineralization' – literally the fixing of minerals in the soil. Mineralized organic matter, conspicuously absent from synthetic fertilizers, is one of the essential ingredients required physically and chemically to hold water on the land.

Organic management also uses crop rotations, under sowing and mixed cropping to provide the soil with near-continuous cover. By contrast, conventional farm soils may be left uncovered for extended periods prior to sowing, and again following the harvest, leaving essential organic matter fully exposed to erosion by rain, wind and sunlight. In the US, a 25-year Rodale Institute experiment on climatic extremes found that, due to improved soil structure, organic systems consistently achieve higher yields during periods both of drought and flooding.[17]

5. Localization

The globalization of our food supply, which gives us Peruvian apples in June and Spanish lettuces in February, has seen our food reduced to a commodity in an increasingly volatile global marketplace. Although year-round availability makes for good marketing in the eyes of the biggest retailers, the costs to the environment are immense.

Friends of the Earth estimates that the average meal in the UK travels 1,000 miles from plot to plate.[18] In 2005, Defra released a comprehensive report on food miles in the UK, which valued the direct environmental, social and economic costs of food transport in Britain at £9 billion each year. In addition, food transport accounted for more than 30 billion vehicle kilometers, 25 per cent of all HGV journeys and 19 million tons of carbon dioxide emissions in 2002 alone.[19]

The organic movement was born out of a commitment to provide local food for local people, and so it is logical that organic marketing encourages localization through veg boxes, farm shops and stalls. Between 2005 and 2006, organic sales made through direct marketing outlets such as these increased by 53 per cent, from £95 to £146 million, more than double the sales growth experienced by the major supermarkets.20 As we enter an age of unprecedented food insecurity, it is essential that our consumption reflects not only what is desirable, but also what is ultimately sustainable. While the 'organic' label itself may inevitably be hijacked, 'organic and local' represents a solution with which the global players can simply never compete.

6. Pesticides

It is a shocking testimony to the power of the agrochemical industry that in the 45 years since Rachel Carson published her pesticide warning Silent Spring, the number of commercially available synthetic pesticides has risen from 22 to more than 450.[21]

According to the World Health Organization there are an estimated 20,000 accidental deaths worldwide each year from pesticide exposure and poisoning.[22] More than 31 million kilograms of pesticide were applied to UK crops alone in 2005, 0.5 kilograms for every person in the country.[23] A spiraling dependence on pesticides throughout recent decades has resulted in a catalogue of repercussions, including pest resistance, disease susceptibility, loss of natural biological controls and reduced nutrient-cycling.[24]

Organic farmers, on the other hand, believe that a healthy plant grown in a healthy soil will ultimately be more resistant to pest damage. Organic systems encourage a variety of natural methods to enhance soil and plant health, in turn reducing incidences of pests, weeds and disease.

First and foremost, because organic plants grow comparatively slower than conventional varieties they have thicker cell walls, which provide a tougher natural barrier to pests. Rotations or 'break-crops', which are central to organic production, also provide a physical obstacle to pest and disease lifecycles by removing crops from a given plot for extended periods.[25] Organic systems also rely heavily on a rich agro-ecosystem in which many agricultural pests can be controlled by their natural predators.

Inevitably, however, there are times when pestilence attacks are especially prolonged or virulent, and here permitted pesticides may be used. The use of organic pesticides is heavily regulated and the International Federation of Organic Agriculture Movements (IFOAM) requires specific criteria to be met before pesticide applications can be justified.[26]

There are in fact only four active ingredients permitted for use on organic crops: copper fungicides, restricted largely to potatoes and occasionally orchards; sulphur, used to control additional elements of fungal diseases; Rotenone, a naturally occurring plant extract, and soft soap, derived from potassium soap and used to control aphids. Herbicides are entirely prohibited.

7. Ecosystem impact

Farmland accounts for 70 per cent of UK land mass, making it the single most influential enterprise affecting our wildlife.[27] Incentives offered for intensification under the Common Agricultural Policy are largely responsible for negative ecosystem impacts over recent years. Since 1962, farmland bird numbers have declined by an average of 30 per cent. During the same period more than 192,000 kilometers of hedgerows have been removed, while 45 per cent of our ancient woodland has been converted to cropland.[28]

By contrast, organic farms actively encourage biodiversity in order to maintain soil fertility and aid natural pest control. Mixed farming systems ensure that a diversity of food and nesting sites are available throughout the year, compared with conventional farms where autumn sow crops leave little winter vegetation available.[29]

Organic production systems are designed to respect the balance observed in our natural ecosystems. It is widely accepted that controlling or suppressing one element of wildlife, even if it is a pest, will have unpredictable impacts on the rest of the food chain. Instead, organic producers regard a healthy ecosystem as essential to a healthy farm, rather than a barrier to production.

In 2005, a report by English Nature and the RSPB on the impacts of organic farming on biodiversity reviewed more than 70 independent studies of flora, invertebrates, birds and mammals within organic and conventional farming systems. It concluded that biodiversity is enhanced at every level of the food chain under organic management practices, from soil micro-biota right through to farmland birds and the largest mammals.[30]

8. Nutritional benefits

While an all-organic farming system might mean we'd have to make do with slightly less food than we're used to, research shows that we can rest assured it would be better for us.

In 2001, a study in the Journal of Complementary Medicine found that organic crops contained higher levels of 21 essential nutrients than their conventionally grown counterparts, including iron, magnesium, phosphorus and vitamin C. The organic crops also contained lower levels of nitrates, which can be toxic to the body.[31]

Other studies have found significantly higher levels of vitamins – as well as polyphenols and antioxidants – in organic fruit and vegetables, all of which are thought to play a role in cancer-prevention within the body.[32]

Scientists have also been able to work out why organic farming produces more nutritious food. Avoiding chemical fertilizer reduces nitrates levels in the food; better quality soil increases the availability of trace minerals, and reduced levels of pesticides mean that the plants' own immune systems grow stronger, producing higher levels of antioxidants. Slower rates of growth also mean that organic food frequently contains higher levels of dry mass, meaning that fruit and vegetables are less pumped up with water and so contain more nutrients by weight than intensively grown crops do.[33]

Milk from organically fed cows has been found to contain higher levels of nutrients in six separate studies, including omega-3 fatty acids, vitamin E, and beta-carotene, all of which can help prevent cancer. One experiment discovered that levels of omega-3 in organic milk were on average 68 per cent higher than in non-organic alternatives.[34]

But as well as giving us more of what we do need, organic food can help to give us less of what we don't. In 2000, the UN Food and Agriculture Organization (FAO) found that organically produced food had 'lower levels of pesticide and veterinary drug residues' than non-organic did.[35] Although organic farmers are allowed to use antibiotics when absolutely necessary to treat disease, the routine use of the drugs in animal feed – common on intensive livestock farms – is forbidden. This means a shift to organic livestock farming could help tackle problems such as the emergence of antibiotic-resistant bacteria.

9. Seed-saving

Seeds are not simply a source of food; they are living testimony to more than 10,000 years of agricultural domestication. Tragically, however, they are a resource that has suffered

unprecedented neglect. The UN FAO estimates that 75 per cent of the genetic diversity of agricultural crops has been lost over the past 100 years.[36]

Traditionally, farming communities have saved seeds year-on-year, both in order to save costs and to trade with their neighbors. As a result, seed varieties evolved in response to local climatic and seasonal conditions, leading to a wide variety of fruiting times, seed size, appearance and flavor. More importantly, this meant a constant updating process for the seed's genetic resistance to changing climatic conditions, new pests and diseases.

By contrast, modern intensive agriculture depends on relatively few crops – only about 150 species are cultivated on any significant scale worldwide. This is the inheritance of the Green Revolution, which in the late 1950s perfected varieties Filial 1, or F1 seed technology, which produced hybrid seeds with specifically desirable genetic qualities.[37] These new high-yield seeds were widely adopted, but because the genetic makeup of hybrid F1 seeds becomes diluted following the first harvest, the manufacturers ensured that farmers return for more seed year on year.

With its emphasis on diversity, organic farming is somewhat cushioned from exploitation on this scale, but even Syngenta, the world's third-largest biotech company, now offers organic seed lines. Although seed saving is not a prerequisite for organic production, the holistic nature of organics lends itself well to conserving seed.

In support of this, the Heritage Seed Library, in Warwickshire, is a collection of more than 800 open-pollinated organic varieties, which have been carefully preserved by gardeners across the country. Although their seeds are not yet commercially available, the Library is at the forefront of addressing the alarming erosion of our agricultural diversity.

Seed-saving and the development of local varieties must become a key component of organic farming, giving crops the potential to evolve in response to what could be rapidly changing climatic conditions. This will help agriculture keeps pace with climate change in the field, rather than in the laboratory.

10. Job creation

There is no doubt British farming is currently in crisis. With an average of 37 farmers leaving the land every day, there are now more prisoners behind bars in the UK than there are farmers in the fields.[38]

Although it has been slow, the decline in the rural labor force is a predictable consequence of the industrialization of agriculture. A mere one per cent of the UK workforce is now employed in land-related enterprises, compared with 35 per cent at the turn of the last century.[39]

The implications of this decline are serious. A skilled agricultural workforce will be essential in order to maintain food security in the coming transition towards a new model of post-fossil fuel farming. Many of these skills have already been eroded through mechanization and a move towards more specialized and intensive production systems.

Organic farming is an exception to these trends. By its nature, organic production relies on labor-intensive management practices. Smaller, more diverse farming systems require a level of husbandry that is simply uneconomical at any other scale. Organic crops and livestock also demand specialist knowledge and regular monitoring in the absence of agrochemical controls.

According to a 2006 report by the University of Essex, organic farming in the UK provides 32 per cent more jobs per farm than comparable non-organic farms. Interestingly, the report also concluded that the higher employment observed could not be replicated in non-organic farming through initiatives such as local marketing. Instead, the majority (81 per cent) of total employment on organic farms was created by the organic production system itself. The report estimates that 93,000 new jobs would be created if all farming in the UK were to convert to organic.

Organic farming also accounts for more younger employees than any other sector in the industry. The average age of conventional UK farmers is now 56, yet organic farms increasingly attract a younger more enthusiastic workforce, people who view organics as the future of food production. It is for this next generation of farmers that Organic Futures, a campaign group set up by the Soil Association in 2007, is striving to provide a platform.

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