

WN *Farming*

World agriculture
Living well off the land: 1






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Here are most of Colin Tudge's books: *The Famine Business* (1977), *Future Cook* (1980), *Last Animals at the Zoo* (1992), *Food for the Future* (1992), *The Day Before Yesterday* (1997), *Neanderthals, Bandits and Farmers* (1998), *Darwinism Today* (1998), *In Mendel's Footnotes* (2000), *The Impact of the Gene* (2000), *So Shall We Reap* (2003), *The Secret Life of Trees* (2005), *Feeding People is Easy* (2007), *Consider the Birds* (2008), *The Link* (2009), *Good Food for Everyone Forever* (2011), *Why Genes are not Selfish and People are Nice* (2013).

Summary

This commentary, the first of two, is about Enlightened Agriculture, or put more simply, Real Farming. The future of life on Earth depends on protection, restoration, and promotion of real farming. This is the one and only way to ensure good nutrition and nourishment.

Get farming and its whole environment right, and we get food systems and supplies right. Get food systems and supplies right and we get dietary patterns right. Get dietary patterns right, and we have the basis for nutritious, nourishing, healthy food for all, that protects against disease and promotes good health and physical, mental, emotional and spiritual well-being.

It is as logical as that. It follows that all attempts to get nutrition and health right at any population level that overlook or ignore food systems and supplies, will fail.

Agriculture designed to make the best use of landscape, and to be maximally sustainable, would also provide food of the highest nutritional and gastronomic purposes, and would employ a great many people. Thus it would solve the world's food problems, and also its principal social problems, at a stroke. I say 'would' because this is not how things are now. Agriculture now is designed for a different purpose – to generate money and profits, in the cause of 'sustained growth'.

Everyone in the world ever likely to be born could be fed to the highest standards, of gastronomy as well as of nutrition, until humanity comes to an end. We already have most of the necessary methods – maybe all that are needed. We could always do with more excellent science. But we need not depend, as we are often told from on high, on the next technological fix. The methods that can provide excellent food would also create a beautiful environment, with plenty of scope for other creatures; and agreeable and stable agrarian economies with satisfying jobs for all.

In reality, in absolute contrast, we live in and are co-responsible for a world in which almost a billion are chronically undernourished; another billion are horribly over-nourished, so that obesity and diabetes are epidemic, and rising; and in which a billion live on less than two dollars a day; a billion live in urban slums – a figure set to increase and probably at least to double over the past half century. With all this, other species are disappearing so fast that biologists speak of mass extinction.

This all must change now. Once we get food right, everything else we need to do can fall into place. Getting food right means good farming. This means productive and efficient husbandry that is kind to animals, that looks after the environment, and creates fine rural societies. It means providing sufficient safe and nourishing food that people like to eat and from which, traditionally, communities have build their communities and civilisations. Gastronomic excellence is essential, too.

What might we be doing, that would provide good food and employment, in an agreeable world? Why aren't we doing it? How do we get from where we are now, to where we need to be? These questions are addressed here

Geoffrey Cannon writes:

Writing as *World Nutrition* editor, this commentary marks the start of a commitment by *WN* to sustainable, rational agriculture, with all its significance for world food systems and supplies and dietary patterns, and for the future of life on Earth. This commitment will continue to until and beyond the International Conference on Nutrition convened late next year by the UN Food and Agriculture Organization.

Writing personally, and professionally in other ways, I have been a friend, colleague and fan of Colin Tudge since before he and I first met 30 years ago. What many ofus are still learning now, Colin understood then. The astounding range and scope of his work as a biologist, philosopher of nature, and naturalist of deep learning and insight, is shown in his books, and his faith and works as a speaker, campaigner and activist.

Our first meeting was in June 1983, in a south London pub of his choosing. My date with him was to discuss the politics of food. He then was features editor of *New Scientist*, and I had discovered that an officially commissioned national report on food, nutrition and health had been suppressed by the UK government. Its main message was that the typical diet was a major cause of obesity and deadly diseases. (As it still is). The relevant national government functionaries, and their colleagues in the food manufacturing industry, didn't like this. Nor, so it was rumoured (correctly) did the then prime minister and ex-food product chemist Margaret Thatcher.

This was hot stuff, and *New Scientist* did indeed follow up my story. But Colin was there already. His 1977 book *The Famine Business* had exposed the kind of hanky-panky I was roused about – and on a world scale. All I saw was a national problem. Colin had faced the world food crisis, and he had solutions. He still has, and essentially they are the same answers, encapsulated by 'enlightened agriculture'.

In 1999 Colin delivered the Caroline Walker Lecture at the Royal Society, as I was moving to Brazil. He gave me a theme to think, work and live by. He quotes a genius then unknown to me, the evolutionary biologist Theodosius Dobzhansky, who said: 'In biology, nothing makes sense except in the light of evolution'. This guides my own work and that of many others now. One of Colin's statements is below:

Rational agriculture, leading to national self-reliance, makes best use of the land, while meeting nutritional needs and gastronomic aspirations. This means producing the most and the best possible human food. It means farming conservatively. Farm land is not simply a food factory. Farms should provide many satisfying jobs. The schism between town and country, the lack of 'feel' among society in general and its leaders in particular for the land and the people who work on it, impedes agricultural and indeed social progress, and is a major source of nonsensical food policy and action.

Introduction

Yes, we (still) need a new world order

DIGGING DEEP THEN DEEPER

HOW TO PUT THE WORLD'S AGRICULTURE BACK ON COURSE

ENLIGHTENED AGRICULTURE, AGRO-ECOLOGY, AND AGRARIAN RENAISSANCE

An introduction to the ideas that really matter in Food and Farming

Here above is how I frame this commentary, which summarises my experience, thinking and conclusions, gained and developed over the last 40 years.

I went to Rome in 1974 for the first ever World Food Conference in a spirit of optimism. At last the world's great powers were to address the key problem of humanity and of the whole Earth: to ensure that we can grow all the food we need, without wrecking all the rest.

The reality came as a nasty shock. That was not why most of the important people were there. The representatives of powerful governments, like those of the US and in Europe, were anxious to make clear that the famines of the previous few years were not their fault, and to make sure that the political and economic systems that enriched their own countries remained intact. Little of lasting value emerged.

Since the 1970s nothing much has changed

Then, like now, was an age of technophilia, even technomania. Genetically modified crops and livestock were on the horizon. Agrochemistry was in full spate. Flavour of the year was TVP: 'textured vegetable protein', spun from beans or fungi or even (a British Petroleum initiative) bacteria grown on oil, shaped to look (roughly) like meat.

Little changes. Some things are a little better. Much is worse. The proportion of people who go hungry is now about the same as then, though the absolute number is higher. This is not because planet Earth cannot support us all. That's the way we – for we are all co-responsible – choose to run our affairs. The plight of other species is now such that even the most sober-sided speak (accurately) of mass extinction.

Technophilia is as rampant as ever. But in the 1970s, agricultural research in my own country of Britain was mostly controlled by a quasi-independent government agency

(the Agriculture and Food Research Council). Now Big Food, the transnational and other giant corporations, calls the shots.

Time for us to take over

To turn the world around, we need to do as was not done in 1974. We need to re-think agriculture from first principles: what we are really trying to achieve and why, what is truly necessary, and what is possible. Should we give such power to politicians and their elite advisers? Is the ultra-competitiveness of Neo-Darwinist 'neo-liberalism' really so efficient? Isn't it more productive to cooperate? Should we rely on hi-technologies to dig us out of holes? Do we really need genetically modified organisms? Do the advantages really outweigh the snags? Who really benefits?

The big-shots from governments, corporations, banks, and almost all their attendant experts and intellectuals are not going to re-think. They think they know what they are doing. If we want the world to be different, we – humanity – have to take food and farming into our own hands. We need a people's takeover of the whole shebang.

I have been thinking about the basic ideas all my life. Since Rome they have begun to gel, in a series of books, and now in our Campaign for Real Farming, about which more at the end of this commentary. The following summarises thoughts so farm and there is more to come in the July *WN*. So as to keep our spirits up – mine too! – here below is the first of a series of photographs taken by Jean-Claude Moubarac of traditional established rural landscape and food systems, in Latin America.



A sun-ray shines on an originally ancient upland agricultural landscape in the Peruvian Andes

The myth of 'the free market'

The world's agriculture, and hence the food supply of the human species, and hence the human species itself – and all our fellow creatures – are all in a terrible mess. This is so bad that our problems could prove terminal within a few decades: for much of what we now hold dear, and half of all our fellow creatures, are already threatened with extinction.

The people with the most influence in the world – the 'powers-that-be': big governments, corporations, banks, and their attendant intellectuals and experts (scientists, economists, and technologists) – tell us that this is because the problems are so innately difficult. There are just too many of us, they say (seven billion and rising) – and by 2050 there'll be another 2.5 billion: which is 9.5 billion, maybe nudging or even eventually over ten billion in all. Furthermore, all these people are clamouring for more and more – and in particular for more and more meat. We all want hamburgers and pizzas with pepperoni, or so they say. Nothing else will do.

Put your trust in hi-technology

Nonetheless, say the powers-that-be, they could do all that we need them to do, if only we trusted them. With the new science-based 'high' technologies they could supply all that is needed. That in the main means more and better industrial chemistry (fertilisers, pesticides, herbicides, antimicrobials, growth promoters) plus bio-technology, including and especially genetic engineering, to rebuild crops and livestock to brave new specifications.

Progress, or so it is said, is held back by backsliders and Luddites – superstitious and elitist people who are afraid of science, and 'ignorant' and stuck-in-the-mud farmers who refuse to change their ways. Also, or so it is said, by creaky economics: do-gooder ill-advised government interventions that continue to throw public money at out-moded ways of farming. What we need, say the powers-that-be, is to let the market rip. Let all compete with all, head to head, fang to claw, without a safety net, so that only the most efficient can survive. Efficiency is measured by rising profit, for this is easily quantified. Whatever cannot be measured should not be taken seriously. In short, or so it is said, the new technologies will enable us to force Earth to provide all we want. If this strategy leads to trouble well, back to the computer-modelled drawing board, and there'll be even newer technologies to dig us out.

All we need to unleash these god-like powers, or so it is said, is 'the free market' which, by means of natural selection and 'the survival of the fittest', the fundamental rule of life thought to be delineated by Charles Darwin in 1859, will ensure that the only farmers left in the world will be those who can compete successfully to do the

things that really need doing. The underlying economic theory, of the ultra-competitive so-called 'free market', is called 'neo-liberalism', which is essentially Neo-Darwinist. This, or so it is said, means it is rooted in science, so it must be right. (See Box 1, below, for what properly understood, Charles Darwin really means).

Put the hi-tech and the 'neo-liberal' political and economic ideology together, and we have modern 'industrial agriculture'. The grand plan is that all the world's farms, and all the food processing from baking and brewing to TV dinners, and all the distribution and retail, are conceived as one great integrated production line, guided by scientists, directed by line managers, overseen by politicians, and all spurred on by the need to compete. This, or so it is said, is 'progress' and 'development', and (that contradiction in terms designed to tick two boxes), 'sustainable development'.

Putting down the people

All this endeavour, though, or so it is said, must be supported by quelling population growth. Only those rich enough to support children should be allowed to have more than one. As Thomas Robert Malthus (known to his friends as 'Bob') pointed out 200 years ago, if numbers continue to grow unchecked then our species is bound to collapse. Even the finest technologies and the most ruthlessly tuned economy cannot feed the world if there are more of us than the Earth can support: and, since a billion now are chronically malnourished, there are clearly too many of us already.

No-one who understands the way the world works can fail to see the logic of all this, say the powers-that-be. Those who object to the new technologies and the 'free market' are idiots, or else deluded (harbouring false memories of some golden past that never was), or are subversives with suspect political agenda of their own.



Varieties of corn, worshipped as the origin of life by the Mayans, still grown in Mexico

Box 1

What Charles Darwin really tells us

These past 150 years are widely seen as the golden age of biology – when it began to seem that all life is understandable or soon will be understood, and that what can be understood can and should be controlled and exploited for human benefit.

In 1859, in *The Origin of Species*, Charles Darwin first explained the mechanism of evolution 'by means of natural selection'. Then Gregor Mendel explained the units of heredity, now known as genes. In the early decades of the 20th century, Darwin's ideas were fused with those of Mendel. In the mid 20th century, genes were shown to be made of DNA. A new generation of biologists in the 1960s seemed to show that all of life could be explained by the interactions of what Richard Dawkins calls 'selfish' genes, as they battled, Neo-Darwinist-style, for supremacy. The logical conclusion of such thinking is genetic engineering: bits of DNA (genes) shuffled and reconstructed to make brand new organisms.

Right from the outset the Darwinist analysis was flawed. It is rooted in excellent science – Darwin was one of the greatest field naturalists of all time – but it was also coloured, as all science is, by the spirit of the age. The prevailing theme of the early and mid 19th century was of strife. This included social upheaval and the building of empires. Darwin was a gentle man, but the mechanism of natural selection that he saw as nature's great creative force is rooted in the perceived need for competition, implying conflict.

Conflict brings death

The Origin of Species reflects Tennyson's ultimately bleak diagnosis from the 1830s, of 'nature red in tooth and claw'. Herbert Spencer made things worse in the 1860s when he characterised natural selection as 'survival of the fittest', an expression that Darwin later adopted. 'Fittest' simply meant 'most apt' but it is usually construed to mean 'strong', so that it's 'natural' for the strong to bash the weak.

Richard Dawkins's reduction of life to a battle of selfish genes is at best simplistic, Attempts to create new forms of life by genetic 'engineering' and then to release them, has the feel of fools rushing in where the wise would surely fear to tread.

Darwin must be seen and revered as one of the great figures in the history of science; but we should stress history. It's time to stop extrapolating along Neo-Darwinian lines, which involves explaining away the world as one long punch-up, albeit dressed up as molecular biology and made respectable by big business.

There is a quite different way of looking at life and the interactions between living creatures, just as plausible and just as valid. Darwin himself recognised 'the contented face of nature', and saw, as a fine naturalist, that animals are commonly cooperative. Indeed, they often seem to behave altruistically.

He was puzzled by these observations, for he was sure that life, at bottom, must be a punch-up – but he did not quite have a monopoly on the idea of evolution, or even on the idea of evolution by natural selection. The lower-middle-class, emphatically non-establishment naturalist-cum-collector Alfred Russel Wallace, independently conceived of natural selection

at about the same time as Darwin. He saw nature as a whole, not as a punch-up but as a great interactive cooperative.

Cooperation creates life

Wallace has his successors. The Gaia hypothesis, first conceived by James Lovelock in the 1960s, acknowledges that nature as a whole is wonderfully interactive – simply the core thesis of ecology. But Gaia says more. It says that living creatures do not merely camp on the surface of this Earth – they profoundly and absolutely affect its fabric: its chemistry and its physical structure.

Thus our atmosphere would contain no oxygen gas if it weren't for organisms that photo-synthesise – it would just be carbon dioxide and methane and hydrogen cyanide and suchlike noxiousness. The relatively lightweight rocks of the continents were perhaps made by living organisms; so without life there would be no land – or not, at least, in a form that we would recognise.

Overall, says the theory of Gaia, life manipulates the Earth in ways that make it more hospitable to life. The Earth as a whole is homeostatic: it maintains its own internal conditions, the central aim of all living organisms. So why not see the Earth as an organism (called Gaia)? And can an organism truly function if it is nothing but an elaborated punch-up?

The Neo-Darwinian, Dawkinesque view of the world has pernicious consequences. It is invoked to support 'Neo-liberalism', encapsulated in Gordon Gecko's chilling line from the movie *Wall Street* – 'Greed is good'. Budding executives go on courses to learn that this is good Darwinism, and so is natural, and good. The thesis is flawed at every stage, but I know people nonetheless who teach such courses. So it was that Enron's CEO Jeff Skilling, who siphoned off millions of investors' loot and is now in jail, declared himself to be a keen student of Richard Dawkins. He was merely competing, he said, which is, he maintains, both natural and necessary.

We need to shift, away not from Darwin but from the crude extrapolation of his ideas. We need to know that science itself is seriously limited in what it can tell us about the world. Its findings are always uncertain. It is always partial, too. In the end science can deal only with what can be seen and measured, and there is no good reason to assume that this is all there is.

Nor does science tell us what is right. If we truly aspire to be wise we need to embed the narrative of science in a broader view of life, one that is properly called metaphysical. The necessary paradigm shift will happen only when we re-engage with metaphysics – which some scientists are beginning to do, and some never lost sight of. But right now, alas, that is not the norm.

The myth and the mess it has made

This is the standard analysis: the argument that underpins all keynote political speeches from representatives of the powers-that-be, whatever the overlying rhetoric.

It is the powers-that-be who are deluded, either that or wicked, or maybe a mixture of both. We are allowing ourselves to be guided by the wrong ideas and to be led by the wrong people. To put things right we have to dig very deep indeed, down to the basement of our minds. And then, we have to take action; and we have to do what needs doing *despite* the powers-that-be; despite the people who really do have the power, and access to our (tax-payers') money, who are convinced that they are right.

There are seven billion people in the world right now, and of them, so the United Nations tells us, one billion (maybe more) are chronically under-nourished. Another billion (at least) are over-nourished, in line for heart disease and various cancers, while the world population of diet-induced diabetics now exceeds the total population of the United States. Half the world's people now live in cities and of these, about one billion live in slums. This means that about 30 per cent of all the people who live in cities, children included, live in slums, shanty-towns, favelas, and yes, in waste-land, under overpasses, in storm-drains, and on the streets. And yet, crazy though this sounds and is, the world's prevailing political and economic ideologies, and the new technologies and the general neglect of the countryside, are driving hundreds of millions of people in China alone, towards the cities. It has become fashionable in some circles to claim that slums are not too bad – 'vibrant' is the word. In reality slum-life tends to be brutal and short.

At the same time, it is now conservatively estimated that about half of all our fellow species – perhaps four million out of an estimated eight million – will go extinct over the next few decades. Underlying it all is the general decay of the Earth: loss and/or pollution of soil, fresh water, natural forests of all kinds, heaths, oceans, and the immediate and growing reality of climate change, which threatens everything (although many in positions of influence remain in denial).

How to feed the 9 1/2 million?

But, or so we are told, the world's population is still rising and will reach 9.5 billion by 2050, and the world's 'demand' for more and more meat is rising. A succession of reports produced at tax-payers' expense have been telling us that we need to produce 50 per cent more food by 2050 just to keep pace with rising needs.

Others since, swept along by panic or sensing opportunity, have upped the ante. Some in high places have claimed that we will need to double food output by the end

of the century. To produce all this extra food, but at the same time to minimise climate change and generally to protect 'the environment', we will need above all, or so it is said, 'bio-tech': new generations of 'genetically modified organisms' or GMOs. 'Nano-tech' too – in fact all modern and lucrative technologies in some guise or other – have been shoe-horned into the act. To oppose their inexorable rise is misguided to the point of wickedness. Without high-tech and the military-scale funds to support these new technologies, we will all perish. Or so it is said.

This analysis suits the powers-that-be. It gives them an excuse. They indicate that blame for the present disasters lies not with them, who are ostensibly in charge, but with us, who have bred irresponsibly and failed to follow the instructions from above. It seems to suggest that they – the standard political parties, the corporations, the big banks, and their entourages – must be left to continue their work, because they alone have the insight and the means to pull us out of the mire.

The basic statistics are true enough (UN data are the most reliable there are). But the standard establishment analysis that is grafted on to them is almost total junk. The powers-that-be like to claim these days that their thinking and policies are 'evidence-led'. But their analyses are based on unexamined preconceptions, carefully selected data, and even straightforward misrepresentation, all seen through the eyes of the zealot, for whom high-tech and 'the free market' are revealed truths.

Lord Acton observed that all power corrupts. Aldous Huxley asked mischievously whether the British government of his day was wicked or merely stupid. George Orwell warned us to beware of intellectuals in general, for 'no ordinary man' could be as silly as they can be. All should be heeded. For there is a quite different way of looking at the world's problems.



An open-air market for many species of fresh fish from rivers and the ocean in Peru

Population is not the problem

I believe that population growth is not an overwhelming problem, as so many people think. Although many parts of the world are looking seriously crowded, there is no need to panic. Indeed, the standard knee-jerk response to rising numbers – 'stop them breeding!' – is in many ways counter-productive. Thomas Malthus, whose ideas lie behind the present fears, was a child of the 18th century Enlightenment. As with many of the ultra-rational notions that emerged in such profusion from that great movement, his views on human population seem largely to be wrong.

Some creatures do simply breed as fast as they can until resources are exhausted, and then collapse: house-flies, for example. But a great many are far more sophisticated. Many species – known to include many song-birds, and owls, and also human beings – clearly adjust their birth-rate to the conditions. How each species makes the necessary judgements remains largely mysterious, but when conditions seem to favour rapid reproduction, or indeed to make it necessary, they do indeed produce more offspring; and when large families seem less appropriate, they have fewer.

Rates of increase are declining

The same UN statistics that tell us that human numbers are due to reach 9.5 billion by 2050, also tell us that the *percentage* rate of increase is going down. In some Western countries the birth-rate at least of the longer-settled peoples is already below replacement. If the percentage rate of population increase continues to decline as it has been doing, then by 2050 it will be down to zero. In other words, the population will stabilise. The 9.5 billion reached by 2050 is as many as planet Earth should ever have to contain. The demographic curve suggests that numbers might stay at that level for a few decades and should then start to decline. If the decline is allowed to continue then over the following centuries we could allow it to become as small as we chose.

What is a desirable end-point? Two billion? Three billion? Michael Soule, co-founder of the Society for Conservation Biology, was wont to point out that at the time of Christ the world population probably didn't exceed 300 million and yet, over the whole world, it was a time of unsurpassed cultural richness and diversity. To advocate such reduction is not to be anti-humanity, but the precise opposite. If we do choose to follow the Malthusian path then we could, as a species, collapse in horrible confusion within a few centuries or indeed even sooner.

But if we allow our population simply to follow its natural trend and decline of its own course to less frenetic levels then we, *Homo sapiens*, could reasonably be contemplating the next million years – and then our descendants could draw breath

and contemplate the following million. In the end there would be far more people if we spread ourselves out through time, than if we all tried to occupy the Earth at once.

It is wrong, too, to blame the world's present ills on excessive numbers. It's consumption that really matters. The Los Angeles family with Mom, Pop, and two bouncing kids consumes far more than the average Bangladeshi village. Yet for all the talk of green technologies, the economic mechanisms and the political rhetoric drive us still towards greater and greater consumption, which is still equated with progress. It looks, simply, once more, as if the rich are causing the problems and the poor are taking the blame.

People are sensible

Neither do we seem to need draconian measures to reduce numbers. All the evidence tells us that, in essence, people elect to have fewer children when they don't feel they need them. People don't need loads of children to support them in their old age, if they have pensions. Women worldwide have shown that they prefer to have fewer children when there are other options open to them. If most of their children die in infancy, they must have a lot if they're to raise any at all. If their only status within their own society comes from being a mother, as in many traditional societies (including some modern urban societies) is still the case, then they are pressured to have as many as is physiologically possible (which, with artificial baby-feeds, is a lot).

If they have other things to do, and if contraception is easily available, they have fewer. As George Orwell said, people are sensible. The ways that encourage smaller families effectively are all benign. These include more economic security, better health with lower infant mortality, more social freedom. All of these are desirable in their own right, and are worthwhile political goals. In contrast, the kinds of measures that produce sudden, dramatic falls in numbers – war, famine, high infant mortality – all result in rapid bounce-back, as people apparently seek to breed their way out of trouble. This is a tactic common among creatures at large.

After all, for our genes, high birth-rate in times of stress (if conditions are compatible with life at all) is a survival tactic. The methods of birth control that are the most likely to work are the ones that are the most benign. Cruelty and general foulness are counter-productive. We can do most good by being nice. Biology, sometimes – quite often, in fact – is on our side.

What can screw things up, as ever, is or are the powers-that-be. Religions often take it in the neck. Some as everyone knows officially forbid contraception and some have sometimes implied we should breed for the glory of God. But the main pro-natalist forces are political. Many political leaders in very different societies have at times encouraged population growth for a whole variety of reasons. These include to

produce more soldiers to send to the front, or workers to slave in factories or to cultivate the 'virgin' land, or just to expand the nation, to populate the Earth. Mao Tse Tung's China, Julius Nyerere's Tanzania, Nicolae Ceausescu's Rumania, and France under various regimes, are among the countries that in recent memory have encouraged big families.

The present governments of the West are afraid of falling birth-rates because they fear a lack of workers to keep the economy 'growing', as more and more people are living well past the traditional retirement age. Pro-natalism continues therefore. At the same time, some scientists now promise that we might all one day live to 120 or more, which they seem to think is a good idea. But at that rate, populations cannot level out, even if the birthrate falls below an average of one child per family, in which case Malthus would be vindicated after all.

So there's a lot that can go wrong. Even so, the most robust demographic projections now tell us that if we can feed 9.5 billion people, and continue to do so for a few decades or centuries, then after that the problem will get easier. In other words, the 9.5 we should reach in 40 years is as bad as things ought to get. At present it seems that Malthus was wrong: the problem of population growth is not open-ended. It can be seen to be finite. This is the best news that planet Earth has had since human beings started farming on an appreciable scale at the end of the last Ice Age, around 10,000 years ago.



Here is where potatoes originally came from. Some of the many varieties in a potato market in Peru

Feeding everybody should be easy

So can we feed 9.5 billion people – and continue to do so for a few centuries, without doing irreparable harm along the way? To judge from the official reports, and the solemn warnings from on high, it's touch and go; and unless we do as we are told – and learn in particular to love genetically modified organisms – then the answer is probably No. So it is said.

I think this is not true. If we did things properly – if indeed we did more or less the complete opposite of what the powers-that-be now recommend – then we should be able to feed ourselves, all of us, *easily*. More, the proper way can and should create convivial societies, and do what needs doing without cruelty, to people or to livestock, without driving our fellow species into oblivion.

One of the few people in high places who really does base his ideas on evidence is Hans Herren, the president of the Millennium Institute in Washington. He points out that the world now produces enough food to provide everyone in it with 4,000 kilocalories a day. Given that about half the people in the world are children, the average requirement is around 2,000 kilocalories a person a day. So we are already producing about twice as much food energy as we actually need.

If that food energy is produced primarily in the form of cereal, or of plant foods including roots, tubers and legumes, plus meat, which is the case, we are producing a commensurate amount of protein. This is because cereal contains roughly the kind of energy-protein ratio that people generally need if they are reasonably healthy and are not, for example, lactating. So we are already producing enough macro-nutrients in the form of energy and protein, to feed 14 billion people. This is twice the present population and half as much again as the world will ever need. Hold that thought.

Reasons for hunger

So why, if we already producing twice as much food as we need, are a billion people now hungry? The answer lies partly with distribution: the food that is produced never reaches the people who need it most. It lies partly with poverty: people grew food even before money had been invented, but the economy of the modern world is such that those without money cannot officially take part at all, and so must go without.

In large part the problem is one of waste, as emphasised of late by the UN Food and Agriculture Organization (FAO). Worldwide, huge amounts of crops are lost in the field. In poorer countries about a third is spoiled even after harvest. In high-income countries about a third of all food is wasted even after it reaches the kitchen.

Food, feed and fuel

Even more wasteful is the proportion of cereals, the most important staples, the staff of human life, which is fed to livestock: about half of it. Commensurate with that waste is the very poor use that is made worldwide of grassland and forest, which provide the grazing and browse that should be used to raise livestock. These are not only the committed herbivores including cattle and sheep, but also, to a surprising extent, the omnivorous pigs and poultry. Nowadays, too, cereal and other potential food crops are grown specifically as bio-fuel, now including about half of US maize, which was and should be one of the world's most important food crops.

As things are now, the human need for food competes with the perceived need of livestock for feed; and the needs of people and of livestock for food and feed now compete with the perceived need for fuel. Most of all, the need of all humanity for food, now competes with the perceived need (or greed) of a minority to make a great deal of money. In the present state of affairs in the world, this need is given priority.

Growing not food but money

Even so why, if we are already producing twice as much food as we need, do the powers-that-be continue to stress that we must grow more and more, and that we must use more and more high technologies to achieve this?

The short answer to this, crude though it might seem, is that present-day agriculture as a whole is *not* designed primarily to provide good food for all people, or to keep the planet as a whole in good heart. Agriculture now is designed to grow as much much money as possible in the shortest time.

To maximise profit it is essential (generally speaking) first to maximise output: 'pile-'em high', as the expression has it. Indeed, the whole global economy is geared to the maximisation of short-term profit, and all our lives and the lives of other creatures and indeed the fabric of the whole world are geared to that.

Some who advocate this kind of economy don't bother to excuse it. They simply cite Darwin, or at least the Herbert Spencer 'survival of the fittest' (which is to say, the strongest and most ruthless) distortion of Darwin. Those who fall by the wayside are deemed to be the weakest. Whole countries are written off as 'failed states'.

Neo-Darwinian folklore has it that the loss of the weakest means that the overall strength of the people who remain must be increased. Others argue in effect, or even quite openly, that it is our moral duty to become rich. When and if we have enough money, and only when that day dawns, will we be able to spare some of it to look after humanity, and the world as a whole.

There is no evidence that such a day can ever dawn – so much for evidence-led policy – and we already have all the money we need to ensure that everyone is well-fed, and that our fellow species survive. But the myth is convenient. It provides a moral reason for present-day acquisitiveness and for putting altruism on hold.

In short: agricultural output is maximised so as to maximise short-term profit which is perceived to be the be-all and end-all. 'Feeding the world' is postponed indefinitely, until some hypothetical day when we have an undefined but indefinitely large pile of money with which to attempt the task. Thus the UK for the past few years has put all social progress on hold while it attempts to pay back an entirely hypothetical debt and so can pretend to be rich again. Note this.

All we really lack is will. We could already afford, easily, to do all that needs doing. Indeed all we really need to ensure that everyone in the world is well fed, forever, and to achieve this without exterminating other species or wrecking the world as a whole, is to design agriculture specifically for that purpose. For this we already have the know-how. This is the accumulated wisdom of the past 10,000 years, abetted by appropriate science. Farming that is designed expressly to provide good food for everyone without wrecking the rest of the world I have called 'Enlightened Agriculture', which I and all the friends and colleagues who are with me in this adventure is sometimes shortened simply to 'Real Farming'.



Fresh fish from the Pacific Ocean offered by the fisherman on a beach in Peru

Enlightened agriculture

To feed everybody well and forever without wrecking the world we need farming that is productive, sustainable, and resilient.

'Productive' obviously means producing enough. But we must also recognise the vital principle of 'Enough's enough'! At present the goal is simply to produce as much as possible in order to maximise turnover and hence to maximise profit. This, and only this, is what lies behind the hype of the politicians and their scientific aides. But so long as this is the strategy, we seem bound to wreck the fabric of planet Earth itself.

'Sustainable' means that whatever we do, we ought to be able to go on doing it, or something similar. The need is to maintain soil structure and fertility – as farmers say, 'keep the soil in good heart'. We must also ensure a supply of clean water – and hope that the global and local climate remains compatible with ordinary life.

'Resilient' means that we need to be able to endure change. It's already clear that conditions are changing, and particularly the climate. Radical environmental change can come about rapidly. This may mean making a quick switch from one system of farming to another – shifting, for example, from arable to pasture or to mixed farming, or indeed from wetland farming to semi-desert.

In general, the way to achieve all of this is to emulate nature – for nature has been tolerably productive (not maximally so, but generally pretty good) continuously for the past 3.8 billion years through conditions that have veered from pole-to-pole tropics, or very nearly, to pole-to-pole ice. So how does nature achieve this?

Three qualities of Nature

Nature does a great many different things, but has three features that predispose to long-term productivity and resilience. Nature is diverse, integrated, and economical.

Diverse

Some ecosystems seem remarkably homogenous. Huge areas are occupied almost solely by sphagnum moss, and the vast boreal forests of North America are dominated by just nine species of tree (eight conifers and the quaking aspern). But when conditions are not so extreme, and fit only for extreme specialists, all wild ecosystems become more diverse with time. This increases the overall biological efficiency – the amount of potential nutrient captured by the ecosystem as a whole. Biological efficiency is a very different concept from the cash efficiency which is the goal and boast of the industrial agriculturalists. Diversity also increases long-term

resilience. As one creature fades away, others take its place. Genetic diversity within the same breeding population is a prime defence against disease. A parasite (virus, bacterium, fungus, worm) that flourishes in one host may find it hard to attack its genetically similar but slightly different neighbour. When populations of animals or plants are genetically homogenous, they succumb all too readily to epidemics.

Integrated

Nature as a whole – every ecosystem with its myriad of species – is tightly integrated. Nature as a whole may seem horribly profligate. Codfish produce a million offspring in the hope that just two will survive to continue the line. Entire continents – or at least the top layers, teeming with life – may erode, as seen in the ancient continents of Africa and Australia; or submerged beneath giant lava flows, as happened in ancient India; or stripped clean by ice, as has happened many times in the high latitudes. But when ecosystems are given a chance to work, nothing is wasted. Every last nutrient is re-cycled. What one creature excretes is another's provender. There is quantified science to support this general impression: in the laboratory and in the field, species-rich systems make better use of what's available than the species-poor.

Economical

Wild ecosystems on the whole are low-input. At least, all ecosystems borrow from other ecosystems – all of us, for example, breathe oxygen that may have been produced far away by oceanic diatoms – but all in the main must make use of what's available. Wild ecosystems do not use fossil fuels, or drill or mine for minerals. They get their energy from the Sun and they get their nitrogen, vital component of protein and nucleic acids, mostly from the air. The Sun will last a very long time and all the components of the atmosphere are assiduously re-cycled.



Orange juice squeezed immediately on the spot, on sale from a street vendor, Peru

Farming in sympathy with nature

To say that to farm well – productively, sustainably, resiliently – we merely need to emulate nature, is to invite obvious criticism. The volcanoes that wiped out ancient India, the winds and rains that took the top off ancient Australia, and the mass destruction of baby codfish are nature too. We don't (do we?) want to emulate them. But if we truly want agriculture that meets our immediate and long-term needs – the long term measured in millions of years – then it makes perfect sense to emulate the natural ecosystems that are most clearly ebullient, that produce the kind of surpluses that we need, and come back smiling after setbacks. Rational faming is ecological. It is real farming, and in this spirit many kindred spirits of whom I am one have founded the Real Farming movement. Join us! See Box 2, below.

Agro-ecology

Industrial agriculture turns its back on nature, builds bastions against it, sets out actively to destroy whatever seems to inhibit productivity. Farms are treated as factories – hyper-efficient (in cash terms) producers of wheat, or cattle, or chickens, or whatever. Agriculture world-wide, is treated as one great production line of whatever can be sold for the most money. In agro-ecology, in absolute contrast, the priority is to produce good food for all. The farm is conceived as an ecosystem: an artifice, but one that seeks to emulate nature, and to establish a friendly, synergistic relationship with the creatures that are not being farmed. The qualities of nature that the agro-ecologist strives to emulate are those of diversity, integration, and low-input.

Diversity

Diversity means mixed farms with as many different species, varieties, and classes of crops and livestock as can reasonably be accommodated within the prevailing conditions. Farm plants and animals are not of course wild. Wild herbs and various 'game' creatures may play important roles, but most creatures on the farm have been selected and bred for particular jobs and conditions – to provide rich and creamy milk on mountainsides, or succulent fruit in walled gardens, or whatever, and to do what they do predictably. Each breed and variety must be genetically diverse – true, not quite as diverse as a population of wild creatures may be. The exceptions are the many crops reproduced by cloning. With genetically diverse livestock, parasites find it harder to spread. Diversity is one of nature's strongest defences against disease.

Integration

Integration means that all the many different plants and animals on the well-managed farm interact with and gain from all others. They do not simply live side by side as in

a botanic garden or menagerie. The examples from traditional farming are legion: mixed cropping (different plants grown together) in many different forms, from wheat under-sown with clover, to agro-forestry; the surplus whey from cheese fed to pigs; the straw from cereals used for feed for cattle and as bedding, which then becomes compost; and so on and so on.

All this again is in sharp contrast to the mono-cultural farm-factory, where a million genetically identical chickens or pigs may live their lives crammed together, while their dung become an expensive and toxic embarrassment, which commonly has been dumped goodness knows where; or the mono-cultural prairie with genetically identical wheat or maize as far as the eye can see, a feast laid on for any parasite that is able to gain access to any one of them.

Low-input

Low-input in practice means organic. The point is not simply to follow all the rules of the official organic societies, such as the UK Soil Association, but to treat organic farming worldwide as the default position: what farmers do as a matter of course unless there is very good reason to do otherwise.

Huge implications

Agro-ecology – as all agriculture always does – has huge social, economic, and therefore political implications. Because agro-ecological systems are diverse (as diverse as possible) and tightly integrated, they are highly complex. This means they must in general be skills-intensive. This means not just labour-intensive, which implies gangs of serfs or slaves, but plenty of skilled farmers, including specialist shepherds, dairy people, and growers. When systems are diverse and skills-intensive, there is no great advantage in scale-up, so enlightened farms, practicing agro-ecology, will tend to be small to medium-sized.

Thus enlightened, agro-ecological farms must be major employers – in sharp contrast to the industrialised farms of Britain or the US which now employ only about one per cent of the workforce. By the same token, present-day holdings, which in Britain these days are commonly of 1000 hectares or more (and much bigger in many other parts of the world) need to be subdivided.

Among the political implications of all this are that as labour and capital is spread more widely, so too – at least in theory – is power. Present-day agriculture is increasingly controlled top-down by fewer and fewer, often transnational corporations, and the strings are commonly pulled by executives and individuals who have no direct interest in agriculture at all. Enlightened agriculture, run on agro-ecological lines, would, or should, be far more bottom-up – 'of the people and for the people', as Abraham Lincoln put the matter.

But the imperative to divide big farms into smaller farms and to give more power to farmers and their communities is *not* driven by ideology, as its detractors are wont to claim. It is driven by principles of biology – in recognition of what we, human beings, *need* to do if we are to survive on this planet in the long term. In contrast, the present dedication to finance-driven, technology-driven is pure ideology. That it claims to be 'science led' and is largely driven by scientists – chemists, molecular biologists and computer theorists, rather than ecologists – is a horrible irony.

Industrial agriculture, too, depends on big machinery requiring huge inputs of capital – which in practice means huge bank loans, which in turn means that much of what the industrial farmer earns, and much (half or more?) of what all of us pay for food, is diverted to pay the interest on those loans. The banks become the ultimate controllers. With small farms, which the farmers themselves or their communities could afford to own outright, the bankers are sidelined – or at least they become partners rather than controllers, their traditional role (for banking as such is necessary, and can be benign).

But can such farming – mixed and generally small-scale, and superficially old-fashioned – really feed the world? Isn't this just an exercise in nostalgia, just as the critics have been saying all along? Have we not been told, over and over, that vast numbers of people, particularly when they live in cities, can be fed only by commensurately large farms?

Small farms produce more food

A farm of 1000 hectares can in general produce more food than one of 20 hectares. But what counts is the amount of food produced per hectare – and, as many studies show, intensively managed land using complex systems (integrated crops and livestock) can produce far more food per hectare than simplified monocultures. A thousand acres of monoculture divided into 50 well-managed mixed holdings could and should be far more productive. The apparent productiveness of factory farms – astonishing quantities of chicken or pig meat, apparently from a few acres – is highly deceptive (though often offered as an example of 'efficiency'). What really counts is the vast acreage needed to produce the corn and soya required to feed those beasts. We don't need a few vast farms to feed humanity. We need lots of little ones.

Over the past few decades Western governments, corporations and banks have put their weight and our money behind industrial farming. Most agricultural scientists spend most or all of their time and our money helping industrial farms. And yet, the International Assessment of Agricultural Knowledge, Science and Technology for Development states that traditional farms, which generally are small to medium-sized, still produce 50 per cent of the world's food, and that another 20 per cent comes from fishing, bush-meat, or people's gardens. We are given the impression

that industrial, high-tech farming is now 'feeding the world', and that we must put even more effort into it. Actually it produces only about 30 per cent of what we eat.

The small traditional farms that do most of the job have been largely neglected over the past few decades and more. Commonly they have been actively destroyed – and the destruction continues as the powers-that-be continue to insist that farms should be more high-tech and high-capital, and should be more mono-cultural, and that small farms should be merged into vast (mono-cultural) 'units'.

Traditional (largely mixed and mostly small) farms have been and remain successful *despite* the ministrations of the powers-that-be. Yet, because they have been neglected, with far less research and logistic assistance than they deserve, most traditional farms fall far short of what they could achieve if only the powers-that-be supported them – using our, taxpayers' money to provide appropriate science and infrastructure, instead of diverting it to support the industrial, finance-led status quo.

Immense potential

Many true experts, including Robert (Bob) Orskov of the James Hutton Institute, Aberdeen, who spends much of his professional life in South-East Asia, Africa, and elsewhere, suggest that most traditional small farms could easily double or triple their present output *not* with more high tech (including the genetically manipulated crops that are being foisted on them) but with simple logistic support, including more stability in the market. Existing traditional farms for the most part are not prime examples of agro-ecology in action, simply because they have not been supported and fall far short of what they could achieve. But even in their present state they do most of the job that needs doing.



Making cheese using modern mathods at a small dairy farm, Ecuador

Box 2

The Real Farming Manifesto
Good Food for Everyone Forever

This is the Manifesto of the Real Farming movement, of which I am a founder. It is addressed to the people of the UK and it also applies everywhere in the world.

Providing the people of the world with a dependable supply of healthy nutritious foods is perhaps the greatest challenge facing humanity. Our current farming methods are clearly failing. They are over-dependent on fossil fuels; they damage soils and deplete scarce water resources; they degrade everyday foods; they reduce biodiversity and squander precious wildlife; they pollute our global environment. They are part of a global food system that is at the mercy of speculators and is every bit as precarious as the world banking system.

It doesn't have to be like this. The Earth's natural resources are easily able to provide a good, healthy diet for everyone living on the planet today – and everyone likely to be living on it 50 years from now and indeed forever. All it will take is an agriculture based on principles of sound biology rather than economic dogma.

Our aim is to encourage and stimulate fresh thinking on this, the greatest challenge of our time. We don't believe high-input, industrial agriculture is capable of reform. Rather than feed people, its aim is to serve the interests of global chemical, trading and investment corporations. Far from creating a secure supply of high-quality food, today's agribusiness can be counted on to obstruct progress.

We believe the people of this country – and the people of the world – are entitled to the best foods our land can provide. We will investigate the most effective ways of achieving this. Though we are passionately committed to good science, we're not convinced that new technologies are required to feed the world well. The key to securing good food for all is rather the careful management of the world's natural resources by well tried and trusted methods. What's needed is the radical re-working of the very best traditional systems.

Among the glittering prizes of a rational farming system are the host of social and environmental benefits that go along with it. As well as fine food, good agriculture will provide clear streams, teeming wildlife and thriving rural communities.

Our members include farmers, academics, writers and business people. We are united by the desire to see the people of Britain and the world provided with better food than they are currently offered. We have no agenda other than to secure a system of agriculture that feeds the world well.

Please support us. Join us on this adventure. What we're seeking is nothing less than a renaissance – for farming, for our countryside and for the world.

Self-reliant, trading fairly



The women of the house preparing lunch for workers on the farm, Colombia

We cannot just impose Enlightened Agriculture. If we want it to become the norm, then we would need to re-think the present world's entire food strategy – insofar as any strategy can be discerned. At present, the finance- and profit-driven market marches to the drum of the late 18th/early 19th century English economist David Ricardo. (Much of modern thinking comes straight from the Enlightenment). Ricardo introduced the principle of 'comparative advantage'. This means that every country should strive simply to produce whatever it is best at producing, and then seek to sell what it's good at to other countries for the highest bidder. In short, all crops and animals are conceived not primarily as food, but as commodities.

Thus it was that at this January's official Oxford Farming Conference, the annual fest at which government and industry boast about how well they are doing, the UK Minister of Agriculture Owen Paterson suggested that the way forward for British farming is to raise prime beef to sell to newly affluent China. This is pure Ricardo.

Again in absolute contrast to the industrial status quo, Enlightened Agriculture farms are able to produce good food in line with the ecological potential of the local landscape and climate. Because such farms can be so productive, and because they produce a good mixture of crops and animals, they could enable almost all countries to be self-reliant in food.

'Self-reliant' does not mean 'self-sufficient'. Self-sufficient means producing absolutely everything that the population might desire. Self-reliant simply means producing enough of what can be grown at home to feed the people adequately.

Many studies show that Britain, my own country, could easily be self-reliant in food – easily able to sustain the 70 million people who could be here soon in fine fettle. Self-reliance does not imply isolationism. British people desire many things that cannot easily be grown at home – tea, coffee, cocoa, bananas, cinnamon, and so on. These can and should be imported. The only provisos are that we should be prepared to pay well for them, and ensure that the money we pay goes to the producers and to their communities. Our money should not go to some intermediary Mr Big. We should also do what we can to ensure that other people do not wreck their own countries, for example by felling rainforest or sweeping aside their own traditional farmers, in order to grow commodities for us. We need a combination of self-reliance and fair trade.

We need to keep trade routes open too, because in some years, especially in these times of climate change, any country could find itself with serious shortages – and then will *need* to import on the grand scale. Still, though, self-reliance with a sensible proportion of trade is a long way from the all-out commodity mentality of Ricardo.

What's true of Britain is true for most countries in the world, including most of those in Africa who periodically slump into famine. *Most* could be self-reliant in food, if that was the intention, if only the farmers were supported. In short, a combination of national self-reliance and fair trade would be a very fine strategy for the whole world; certainly a vast improvement on what we have now.

But if we did follow the ways of agroecology, and root our strategy in self-reliance, wouldn't we finish up with a diet that was too boring by half? Wouldn't we condemn ourselves to a life of austerity, all quinoa and lentils? Who, apart from dedicated hermits, could tolerate that? But we needn't be ascetic.

In fact, the precise opposite. Enlightened agriculture is also for gastronomes.



Making tortillas the traditional way for sale in a street market, Mexico

Farming for gastronomes



Dried fresh produce in an open market including beans, fruits and nuts, Mexico

To ensure that we all have plenty to eat, and of the best quality, we need to do three basic things. First and foremost, we must grow plenty of staples – cereals, pulses, and tubers – in general on the field-scale, which means by arable means. Then, to make sure that we have all the right minerals and vitamins and plenty of flavour, we need to practice horticulture virtually on the biggest scale that the land can support.

When all that is done, we will still find, in almost all countries, that we have plenty of upland and wetland and semi-desert left, and upland and steep mountain-sides, that are very difficult to cultivate; and on these we can and should raise grass and trees to feed ruminant animals, notably cattle and sheep. There will always be leftovers too from the fields and from the kitchen and these are the traditional provender of pigs and poultry. Put the three together – a good dose of arable farming, plenty of horticulture, and animals fitted in where they can – and we have the basic structure of traditional farming, which is also the structure of Enlightened Agriculture.

The net result is to produce plenty of plants, not much meat, and maximum variety. These nine words – 'plenty of plants, not much meat, and maximum variety' – summarize all the most convincing nutritional theory of the past 30 years, which in general calls for modest protein, a relatively low intake of fat (with emphasis on unsaturated fats), plenty of fibre, and a high intake of vitamins, minerals. It also involves a new and still largely mysterious class of agents such as plant sterols which the food industry likes to call 'nutraceuticals' and I prefer to call 'cryptonutrients': somewhere between a vitamin and a tonic. In other words, farming that is truly

designed to be both productive and sustainable also provides us with food of the highest nutritional standard.

Basis of the great cuisines

There is one further serendipity. For the magic nine words – 'plenty of plants, not much meat, and maximum variety' – also encapsulate the general structure of all the world's greatest cuisines: Turkish, Provencale, Southern Italian, Persian, Indian, and the many forms of Chinese – and indeed the best of British and traditional American, as indicated in Jean-Claude Moubarac's photographs that illustrate this commentary, of Latin American food systems. All tend to be variations on a theme of cereal with plenty of vegetables, fruit, and nuts, with meat used primarily for flavour, as stock or garnish, the centrepiece of the meal only at occasional feasts.

In other words, agriculture that is designed expressly to provide us all with good food forever, thereby meets the highest standards both of nutrition and of gastronomy. In fact, all we really need to do the whole world over is to once again learn how to cook, re-discovering the great cuisines that at least nine times out of ten are on our doorstep. Agriculture that was led by good cooks would work very well

Finally (for this month)…

Enlightened Agriculture and all that goes with it is conceptually straightforward, and obviously suited to our needs. So why have the powers-that-be chosen to do the precise opposite? I answer this question in *World Nutrition* next month, July.



A delicious meal of traditional dishes made from local produce, Mexico

Further reading

This is not a conventional journal paper and I prefer not to list references in the conventional way. A full list of references would fill many pages. I encourage you the readers to access whatever link occurs to you as you read the text. In particular please access and join our Campaign for Real Farming, the Manifesto for which is above. Here are a few sources including three of my more recent books.

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Originally ancient carefully tended rural landscape in the Andean uplands, Peru

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