INTERVIEW FOR *THE LAND*

BY SIMON FAIRLIE

*Conducted by email, October 2018*

SIMON FAIRLIE: (SF)

The ZCB land use proposals were drawn up in 2013 by a team

led by Peter Harper, one of the pioneers of the alternative

technology movement. Peter has since retired from CAT,

but he still teaches using the computer model he designed to

work out changes in land use and diet. He kindly agreed to

answer some of our questions.

*SF I’ve seen the spreadsheet that you used to work out these*

*land use changes, Very impressive and fascinating. It has no*

*less than 60 columns. Could you explain, very briefly, how it*

*functions.*

Peter Harper (PH)

[SHORTER ANSWER TO QUESTION]

It’s much simpler than you make it sound. In Column A we list the main agricultural commodities, things like ‘barley’, ‘peas’, ‘beef’, ‘eggs’ etc. They are split into two main groups, crops and livestock. Then we attach various numbers to each category, like total tonnage produced, land use per tonne, emissions intensity etc. We can add up the columns to get national totals, and we can add *these* up to get big headline figures for the whole agriculture sector, such as emissions, land used, total protein etc. Then in Magic Column Z we can insert alternative ‘what if?’ amounts and look at the results. Of course we tried all sorts of things, but the main scenario is the commodity mix that simultaneously reduces emissions by about 90%, feeds everybody very well, does not rely on imports, improves biodiversity, reduces nitrogen and phosphorus pollution, and releases over 10 million hectares for energy, carbon sequestration and wildlife.

[LONGER VERSION]

We have listed the main classes of agricultural commodities that feed into the UK food system, then attached to each commodity standard statistics, either from government or industry or from the academic literature. These include for example the total tonnage produced, carbon intensity, land intensity, energy content, protein content and so on. The spreadsheet format then makes it very easy to generate ‘derived statistics’ such as the total emissions from any particular commodity.

In my view, the most significant innovation was to divide the spreadsheet into two large groups of commodities, those based on crops and those based on livestock, each of which could be analysed separately and then compared. This was never done before, obscuring the enormous ‘signal’ that emerges from making the crops/livestock split. Of course you can split up the data any way you like, for example comparing UK with overseas production, but the crops/livestock distinction remains paramount.

The spreadsheet delivers aggregated statistics just by adding up. It gives us for example the total emissions from the agricultural sector, the area required, and the delivery of tonnage, protein and energy into the food system. Perhaps its most useful function is to allow a user to ‘model’ alternative patterns, simply by altering the numbers in the Magic Column Z. This will then tell you whether this delivers enough to generate a viable diet at the retail end of the food system, what the emissions are, and how much land is needed.

*SF How do ghost acres fit into the scenario — the food and*

*fibre we currently import?*

PH

If you are doing a scenario it is important not to ‘cheat’ by simply importing anything you like. We decided early on that in a rapidly-decarbonising world Britain should not rely on imports. The scenario simply bans imports of livestock products and raw materials for feeds. It does not allow imports of commodities that can be produced in the UK, but does allow ‘luxuries’ such as coffee, chocolate, olives, bananas etc. These are things that help overseas producers, but which if necessary we can do without.

Regarding fibre (presumably you are thinking cotton) we did not pay this as much attention as we perhaps should have done. Cotton can be substituted by rayon and acetate from any cellulose source such as wood. Indigenous fibres such as flax, hemp and nettle would be worked into agricultural rotations. Note these are all biodegradable.

Presently the UK imports nearly all its structural timber. Much of this could be replaced by native production in the scenario, but a curious quirk of carbon accounting means that importing timber actually gives us a carbon credit, so provided it does not compromise the sustainability of trading partners, this can continue.

*SF In your model, are temporary leys in mixed arable farming*

*systems classed as grassland or as arable? Are the arable areas*

*self-fertilizing through green manure, or do they rely on*

*manure from grazing areas and residues of biomass energy*

*production or what? Is this all organic husbandry, or do we*

*have artificial nitrogen made from biomass, superphosphate*

*etc?*

PH

It depends how temporary the leys are. If it’s just a year of grass, it’s part of the arable rotation. If it’s improved pasture ploughed and reseeded every few years, that’s counted as grassland. Regarding fertility, that turned out to be quite a challenge, and we had to assume that a large fraction of the nutrients in the food commodities could be recovered in various ways and returned to the land. Of course we also had the much-reduced contribution from livestock manure, we had digestate from the anaerobic digestion plants, and we assumed there was a fair amount of green-manure. Still, we found the system gradually ‘ran down’ and needed topping up with mineral fertiliser. So it was not 100% organic, but the total amount of ‘artificials’ was only 10% of the level currently used.

*SF Are the land use changes summarized in the figure above*

*the only option? Or is there a range of sustainable options,*

*and if so how wide or narrow is this range? Which 1Mha*

*squares are negotiable and which are non-negotiable?*

PH

Of course there is wide range of options, and they can be explored simply by entering alternative figures into Column Z in the spreadsheet. However most things you can try don’t ‘work’ in that they generate too high emissions, do not release enough land for other uses, or fail to feed the population. We created our own non-negotiables, basically that land uses could only change in a more carbon-conserving direction. So arable could become pasture or forest but not the other way around. Basically arable stayed arable, while pasture either stayed in grass or was replaced by other perennial species.

*SF Advocates of pasture-fed cows might be dismayed to see*

*that while grazing has been slashed by 75 per cent, the area*

*devoted to fodder crops has only been cut by 40 per cent. Is*

*this to keep pork and chicken lovers happy? What would your*

*model say to reducing fodder crops to 0.5 Mha, allocating*

*the extra 1 Mha to temporary grassland. Instead of pork*

*and chicken, this would provide dairy/beef produce, more*

*immediately available fertility, more soil carbon capture,*

*lower energy requirement and more biodiversity on arable*

*farms. (By my calculations you get about tonne of organic*

*pork from a hectare of barley against 8 tonnes of organic milk*

*from a hectare of clover ley, which makes milk nuritionally*

*superior by some distance).*

PH

I am entirely happy to argue the toss here, but we are simply going on the published carbon and land intensities of the various livestock types. Remember that milk is mostly water, so a kg of pork contains at least five times more protein and several times more energy than a litre of milk. Meanwhile grass-fed cattle produce three or four times more GHGs than pigs. The numbers simply forced us to favour non-grazing livestock, but if you have ‘alternative facts’ we are listening. And you’ve still got 3 Mha of pasture, assumed to be top-quality organic on mixed farms, so what are you grumbling about?

*SF What happens to crop residues, food processing waste*

*and consumer food waste in the model? Are these prodigious*

*quantities of nutrients fed to livestock or are they used for*

*energy? If the latter how much energy do they provide?*

PH

There is an important distinction to be made between energy and nutrients. We want to conserve nutrients at all costs because we want to minimise mineral inputs – criminal to use them merely for energy! There needs to be a ‘waste hierarchy’. Food waste is high quality and should be collected and remanufactured into animal feeds as far as possible, although some is likely to be anaerobically digested. The digestate is not edible but conserves the nutrients for fertiliser. Animal manure is also used as fertiliser. Biomass input for the energy system comes from miscanthus and from short-rotation coppice and forestry, which has displaced pasture. These need little fertiliser, and processing them does not entail a serious loss of nutrients.

*SF Recently many people have been claiming that improved*

*pasture management through mob-grazing and similar*

*techniques can increase the amount of carbon sequestrated*

*in pasture land. Do you give any credence to these claims,*

*which presumably could alter the pasture/woodland balance?*

PH

Perhaps I have missed something here, but it seems that the basic claim is that tall grasses have deep roots that die when the sward is suddenly grazed off, thus ‘injecting’ carbon deep into the soil, from where it cannot escape. An interesting idea, but one which has not found favour in the academic soil research community, who insist that carbon content quickly reaches an equilibrium level and any more is simply oxidised and released. Well what do we say? They might be wrong, but look, if the basic claim is correct, you’d get the same result by infrequent mowing, collecting the grass, extracting the energy from it, and using the digestate as fertiliser. True you can’t eat it, but we are not short of food: we are short of energy and fertiliser.

*SF The large drop in ruminant numbers, as well as releasing*

*land, would result in lower methane emissions, which would*

*result in global cooling (whereas a drop in CO2 emissions*

*does not result in cooling). This cooling is comparable to*

*carbon sequestration. Does the model take this into account?*

*(The GWP100 methodology doesn’t.)*

PH

No, the model does not. It only measures CO2e, that is the total level of all greenhouse gases conventionally weighted. It is hard to think how the effect you mention could be wired in directly. Having said this, the model allows us to vary the relative GWPs, and ‘extra weighting’ of methane could partially simulate the effect. In the construction of the model I sometimes argued that GWP100 was daft if we wanted to decarbonise in 20 years, but my colleagues and other experts felt that the prevailing convention should be observed lest we be accused of special pleading. Perhaps it is now time to revisit and systematically change the methane emissions to GWP20 values.

*SF Do you envisage land uses being clumped together in large*

*blocks or peppered around the country. Would we get all the*

*arable on the east of the country, and all the biomass in big*

*blocks to reduce transport to mega power stations etc? Or is*

*their scope for decentralization?*

PH

Because we added everything up into large totals, many people got the impression of a kind ‘Mondrian’ landscape with huge specialised blocks. On the contrary, we thought more in terms of Jackson Pollock, with endlessly fine local detail and as much mixed organic farming as possible. Still there is no getting away from the fact that the best arable soils and conditions are in the east, so this is where most of the food would come from, while the west would concentrate on perennial crops and habitat creation. We might find ‘land sharing’ in the east and ‘land sparing’ in the west.

*SF The loss of pasture and the increase in woodland would*

*mean the canopy would close in on the British countryside*

*making it a darker place. Trees would be grabbing more of*

*the sunlight and everything else would be receiving less. How*

*do you think this would affect biodiversity; and how might*

*people react?*

PH

Goodness you are turning the screws! Pasture is not simply replaced by trees, but by all manner of other systems depending on local conditions. Many of these, such as tall perennial grasses, coppice and short-rotation forestry, would be harvested fairly regularly. They would not get tall and oppressive. But in some areas, yes, extensive forests would be created or allowed to regenerate, and many would be managed for various purposes. All this would be a great benefit to biodiversity: it’s hard not to beat standard pasture! Tall plants offer much greater cover, habitat complexity and litter fall for the soil fauna. The soil is never disturbed.

*SF There are questions to answer about how biomass energy*

*gets shared out. There are limits to the amount anyone can eat*

*so the owner of land producing food has an interest in seeing*

*that the food gets sold to other people. On the other hand*

*there are no limits to the amount of energy an individual*

*can consume. (There is so I am told, a landowner in our*

*neighbourhood who heats his home with hay bales harvested*

*off five hectares — hardly a sustainable model for the whole*

*of the country.) What, in the Zero Carbon Britain of the*

*future might there be to stop a rich landowner processing all*

*their biomass into liquid fuel to power a helicopter or launch*

*a private moonshot?*

PH

The Scenario did not say anything explicit about land ownership, but I think we have to imagine that the decarbonisation transition must a rather strictly controlled national programme, somewhat like the situation during World War II. During the war, land-owners had much less discretion about what they could do with their land. The ‘men from the ministry’ came and gave orders, and it was widely accepted as a matter of national survival. Perhaps times are different now, but I cannot imagine outrageous examples of the kind you suggest, being allowed to take place. And there might well be rationing to ensure a general sense of fair shares.

*SF Since 2013 has anybody else taken this work forward , or*

*been looking at future land use in the UK in a similar way?*

*Has DEFRA or any other government body commissioned*

*any research on the matter?*

Not as far as I know. We were somewhat surprised by the lack of feedback and criticism. The general reaction seemed to be that if it was not politically feasible right now it was dead in the water and could be safely ignored. The questions we were asking (and provisionally answering) were far too Big and controversial. But time has slipped by, and we need Big now more than ever.