Lamb curry or Christmas dinner. Who cares?

Science and environment journalist Myc Riggulsford talks to Professor Adisa Azapagic about calculating carbon and cutting the energy costs in our food chain.

A lamb curry ready-meal that you buy from a supermarket has twice the carbon emissions of a much more complicated home-cooked Christmas dinner, according to the University of Manchester's Professor of Sustainable Chemical Engineering, Adisa Azapagic.

Professor Azapagic has just embarked on a five year mission to set up the Centre for Sustainable Energy Use in Food Chains, a partnership based across three separate university campuses, looking at how we can cut the energy and carbon costs of our food on its journey from farm to plate.

Our food uses energy and generates carbon emissions at every stage of its production, from planting seeds and breeding animals, fertilising, growing and harvesting crops, to transporting the raw food materials, processing them into the brands and products we recognise and want to buy, and then distributing them to supermarkets. And finally we bring them home into our fridges and freezers. Then we cook or reheat them to feed ourselves and our families.

But if Britain is going to meet our legally agreed climate change targets by cutting our carbon emissions in the future, then we need to look at all the aspects of our lives where we could make significant energy and carbon savings, and that includes in our food.

"We need to understand first of all where the energy and carbon hot spots are", says Adisa Azapagic. "About 95% of the foods we eat in Britain, Western Europe, and the USA, are now processed in some way, and almost everyone now buys the bulk of their foods from supermarkets. So that's where we will be concentrating at first, looking for the hot spots of intensive energy use and related carbon emissions in food processing".

The new Centre for Sustainable Energy Use in Food Chains, led by Prof Azapagic at Manchester, Prof Savvas Tassou at Brunel, and Prof Peter Fryer at Birmingham, will be working closely with over 30 industrial partners including household names such as Heineken, Heinz, Kellogg's, Kraft Foods now Mondelez, Premier Foods, Tesco and Waitrose, all of whom want to increase energy efficiency and cut their greenhouse gas emissions.

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appearance on the supermarket shelves", says Adisa Azapagic. "And when we get them home we typically put them straight into the fridge or freezer".

Which is a chilling thought. As an environment journalist, I had believed that most of a crop's energy use and carbon emissions were in the energy-expensive production of modern fertilisers, either to encourage grass pasture or to grow grains and vegetables. And then there would be the further environmental and energy costs of cleaning up the polluted rivers and streams when excess fertilisers run off into watercourses, which is one reason why I favour organic farming. Apparently, I was wrong.

"Yes, ammonium sulphate and ammonium nitrate are energy intensive to produce in the first place, and then to transport and turn the raw materials into fertilisers for farmers to use", says Adisa. "But the greatest greenhouse gas emissions in agriculture come from the application of the fertilisers, not their original production. Nitrogen in the fertiliser and oxygen from the atmosphere react to form nitrous oxide, a greenhouse gas three hundred times more potent than carbon dioxide".

In meat production the major impact of farming comes from the fermentation of grass and all the other food in the sheep and cattle's guts, leading to serious quantities of methane emissions from both the front and back ends of the animals. Industrially preparing animal feed from corn and other grain, and making it into sheep and cattle nuts, also increases this environmental impact.

"We haven't looked at the environmental and energy impact of keeping horses, but given the proportion of horse meat that seems to be turning up in the cheaper end of the processed food chain at the moment, perhaps we should," says Adisa.

On the positive side, a not necessarily statistically reliable piece of research from May this year, to promote Fresh Week, showed that 24% of Britons surveyed claimed to have cut down on the amount of processed food they were eating following the horse meat scandal. Apparently British fruit and vegetables have made a comeback, according to Cold Feet actress Fay Ripley, who has the unlikely accolade of being branded a Tefal ambassador for the non-stick frying pan makers who commissioned the research.

"If the produce is grown in greenhouses which are in the UK, and are typically heated using electricity, we may still be better off importing vegetables and fruit from abroad. If they have been grown in the sun the energy consumption and carbon emissions may be lower", says Adisa Azapagic.

The five year project will be looking across different food types trying to identify different product hot spots, where interventions in processing, at the consumer end, and in policy requirements could cut energy use and carbon emissions. The final recommendations will suggest ways that government could help industry and consumers to make the changes needed.

Adisa Azapagic's background is in chemical engineering not agriculture, but as she explains, that makes her better placed to understand the processing side of our food.

"We need to work on understanding the whole life cycle and environmental impacts of food production", says Adisa. "The carbon footprint is one impact. But there is also an economic impact along the supply chain, providing jobs and re-investment for industry and cutting costs for consumers. Can we drive these parameters apart, adding more value, such as by processing foods, but reducing the environmental impact at the same time?"

By developing the Centre across three universities, with different experiences and approaches, the researchers hope to bring together a range of interdisciplinary skills.

"We also need to assess the social impacts of food production in developed countries", says Adisa Azapagic. "For example, these days many people don't care to cook from scratch, or they may even not know how to. This has led to an increasing reliance on ready-made, convenience food".

Slightly fed up with strident criticisms from some vegetarian activists, I have always found the widespread but poorly referenced claims about the enormous quantities of water needed to produce steaks instead of corn difficult to believe. As a small farmer who keeps a traditional breed of sheep, Exmoor Horns, on very rain soaked pastures myself, I know that it simply wouldn't be possible to grow crops in places that my ewes can survive happily.

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So what about the claimed water impacts?

"There has been very little reliable work on water use so far", says Adisa Azapagic. "Water footprints are only just starting to be calculated, we simply don't have enough reliable data or even the methodologies to calculate them yet".

For the first six months the Centre expects to be fact finding, then once the team know where the hot spots are, they will start trying to find ways of reducing the energy used in our food chain.

"What we look at in the later years of our research will depend upon our findings. We may look at alternative supply chains, for example, suggesting how supermarkets source our food in future. For instance, do we still import vegetables and meat or do we produce them locally?" says Adisa.

The Centre for Sustainable Energy Use is being established using a £7 million grant funded by the Engineering and Physical Sciences Research Council, of which £1.9 million has been awarded to The University of Manchester.

Thanks to Adisa's previous work, The University of Manchester's School of Chemical Engineering and Analytical Sciences provides free tools for carbon calculations over the life cycle of industrial activities, which have won awards from GlaxoSmithKline, the Institution of Chemical Engineering, and the Chemical Industry Association, and can be downloaded free at www.ccalc.org.uk.

"The CCaLC tool we have developed is now used by thousands of users across the globe, including industry, government bodies and NGOs to calculate their carbon footprint", says Adisa Azapagic.

So should we worry as individuals? Well, according to our Professor of Sustainable Chemical Engineering, the carbon footprint of each lamb curry which we eat as a ready-meal emits around 6 kg of carbon dioxide equivalent. That means that the lamb curries alone, not including the other ready-made meals, which roughly 30% of British adults all eat once a week, is equivalent to 140 million car miles, or 5500 car trips right around the world. There must be room for some movement there.

The Centre for Sustainable Energy Use in Food Chains is a partnership between the universities of Brunel, Manchester and Birmingham.

The CCaLC carbon footprinting tool available at www.ccalc.org.uk was developed by Professor Adisa Azapagic with funding from the Carbon Trust, the Engineering and Physical Sciences Research Council, and the Natural Environment Research Council.

> FIND OUT MORE
about carbon calculations and the Centre for Sustainable Energy Use in Food Chains
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