Fair Trade and Ethical Sugar: 
A Firm-Centred Analysis of Market Morality

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The question ‘what should we eat?’ has been a prominent public debate for many years now. Much more than a medical question as to what constitutes a healthy diet, or a culinary one about which foods taste the nicest, this debate is a profoundly moral one. It concerns issues of provenance and production techniques, and, ultimately, our own human nature. Moreover, it is a public debate with a sprawling character to it, relating the consumption of food to things as diverse as cultural history, international development and the future of the planet. Such overlapping moral dichotomies are the product of society’s prevailing ‘food concerns’ and they are to be answered not just by consumers but by the food manufacturing industry and their downstream farm suppliers. Either through changing market demand, or through political and business lobbying, these concerns provide opportunities for, or, perhaps more commonly, challenges to, the continued growth of the agri-food sector, and for that reason are subject to intense scrutiny and vested interest. Lest we forget, the food and drink supply chain in the UK is worth over £200bn, or 7% of GDP (UK Cabinet Office 2008).

Three food concerns in particular have dominated recent debate. The first relates to public health and food safety. In the context of the UK, for instance, the stymied introduction of Genetically Modified Organisms for direct consumption, the fallout of the BSE scares, and the marked rise in obesity have each framed food as an issue of human security. Common to each concern has been the way in which the (over) extension of industry into the growing and preparing of food has been identified as a culprit: in the GMO debate it was the bio-technology companies and their attempts to replace existing plant varieties with genetically-altered seeds resistant to herbicides or pesticides; in the BSE crisis the decision of cattle farmers to feed their animals the meat and bones of other cows, the cheapest available input; and in the obesity debate, the excessive inclusion by food manufacturers of cheap fats and sugars in their pre-processed products. The conclusion typically drawn from these readings is that the agri-food sector cannot be trusted to forfeit profit for public safety, and so greater transparency and regulation of production is needed to keep these impulses in check.

The second food concern relates to rural livelihoods and food culture. ‘Slow food’ movements that have tried to valorise seasonal produce and traditional home cooking alongside farmers’ markets have attempted to shorten the supply chain and re-connect consumers with local primary producers have together made the case that different ‘worlds of food’ need to be promoted based on a renewed sense of tradition and duty (Morgan, Marsden and Murdoch 2006). By the same token, fair trade schemes have encouraged their own form of ‘food justice’ by encouraging consumers in the Global North to pay more for products such as coffee, cocoa and bananas grown by certified small-farmers. Both trends have targeted the ‘food from nowhere’ culture that is felt to prevail among the homogenised world of chain restaurants and supermarket retailers, and in doing so ‘re-territorialise’ food and redistribute wealth accordingly.

The third food concern relates to climate change. The food system as a whole contributes around 19% of the UK’s greenhouse gas (GHG) emissions, with the meat and dairy industry accounting for half
(Garnett 2008). While earlier measures such as food miles – the distance commodities travelled before they reached our plate – have been superseded by more sophisticated measures such as lifecycle product carbon footprinting, the worry they encapsulate remains the same: too much energy is being wasted in the production of food. The advent of bio-fuels in developed countries has since transmitted this concern into the energy sector. For instance, it has been claimed that the GHG emissions saved by putting corn-derived ethanol in the car tank are actually outweighed by the amount of carbon that is released in the process of growing the corn in the first place (Searchinger et al. 2008). At root what is being made is a demand for ‘true cost accounting’ and for the externalities of energy-intensive agriculture to be incorporated into the way we value it. In this respect organic food has been promoted as a way to reduce fossil fuel inputs on the farm, while proponents of vegan/vegetarian diets have argued that a greener society can be reached simply by eating less ruminant-based products (Soil Association 2010; Viva 2010).

Together these three concerns suggest that the ‘conventional’ part of the agri-food sector is in crisis. As expressed by the UK Cabinet Office (2008) in its Food Matters report ‘existing patterns of food consumption will result in our society being loaded with a heavy burden of obesity and diet-related ill health’ and ‘existing patterns of food production are not fit for a low-carbon, resource-constrained future.’ The oppositional and marginal elements of the contemporary food system that claim they could alleviate this crisis have in turn been united by scholars into such conceptual vehicles as ‘the food sovereignty movement’, ‘the ecologically-integrated paradigm’ or ‘alternative food networks’ (Goodman 2003; Land and Heasman 2004; McMichael 2006).

Whilst these concepts are valuable in promoting a persuasive normative agenda and offering an intelligible ordering framework for the plurality of agri-food developments, they tend to break down when subject to specific empirical scrutiny. Not only are there divisions within the ‘alternative’ sector (is it better to eat locally-grown British or development-friendly imports? Mass-produced organic or small-scale industrial? To spend more on better quality or just eat less altogether?) but it is also difficult to seal off many producers into one or the other binary model (Sonnino and Marsden 2006). For example, while some firms, such as the large Italian egg producer Ovopel, have moved from a standardised price-competing product toward an extensive range of products imbued with natural and animal-friendly qualities, others, such as those firms dominating the Californian organics industry, have moved to the type of capital-intensive and migrant-labour based production process redolent of their non-organic competitors (Murdoch and Miele 1999; Guthman 2004). Related to this, simply describing the conventional agri-food model as in crisis tends to project analysis toward the construction of a better (in some cases ideal) alternative and away from the study of existing corporate adjustment. In overlooking the ways in which firms in the agri-food sector have offered their own answers to these challenges, through the marketing of ‘functional foods’ to counter dietary disease, or the introduction of sustainability standards for example, such accounts fail to acknowledge how firms have seized upon and re-shaped moral discourse for their own market development.

This paper takes the UK sugar industry as a prism through which to study such negotiations by conventional agri-food firms of this contested ethical terrain. It asks how they have responded to the crisis of legitimacy in the agri-food sector, what the important political and economic factors were in structuring this response, and what implications this has for the future of farming and food provision.

Seizing the Ethical Agenda in the UK Sugar Industry: Fair Trade and Carbon Reduction

The UK sugar industry involves two parallel production systems, a legacy of the country’s geopolitical history. Tate & Lyle operates a sugar cane refinery on the banks of the River Thames in London, turning raw cane shipped from developing countries, many of which were former British colonies, into 0.6m tonnes of refined white sugar. British Sugar, which started domestic production in 1936 in response to war time shortages meanwhile, operates four beet processing factories in the east of the country where it slices and boils sugar beet into 1.1m tonnes of white sugar. Together these two companies supply virtually the entire UK market for sugar, which is worth around £1.1bn in total.
Despite their differing production models, these two companies have together endured a number of joint attacks on their business morality. During the post-war period they have continually been accused of undermining efforts by policy-makers to increase market competition and encourage healthy eating, the costs of which have been borne by poorer farmers abroad and out-of-pocket and overweight consumers at home (Swedish Competition Authority 2002; Oxfam 2004; Food Ethics 2009). Yet in the last two years something of a sea change has occurred. Tate & Lyle signed what was at the time the biggest producer contract for certified ‘Fairtrade’ goods in history, and both Tate & Lyle and British Sugar have seized the ‘green agenda’ by promoting organic production and committing to lower their GHG emissions.

In 2008 Tate & Lyle committed to convert all its retail products to Fairtrade by the end of 2009. This increased the amount of sugar certified by the Fairtrade Labelling Organisation (FLO) in the UK ten times over and meant that £2m a year would be transferred to growers in Belize. Given that supermarkets sell packaged sugar at a marginal or no profit and stock only one brand of the popular ‘white granulated sugar’, it is worth asking why Tate & Lyle agreed to move to this higher cost form of production. Weren’t the company concerned that they would lose supply contracts to their competitor? Tate & Lyle first approached the FLO as they felt that consumers were increasingly interested in provenance and ethics and, in this respect, the company was sitting on a good story. It had long sourced its raw sugar from Belize, which employed a large number of small growers, and had good commercial and logistical links with the country. As such, certification was relatively low-cost and risk-free. As for its contract negotiations with the big retailers, it was known that ethical and environmental considerations on high-profile product lines were important factors in their decision, and so the company could use this as leverage.

Another response to changing market conditions by Tate & Lyle can be seen in the introduction of organic sugar, free from herbicides and pesticides, in 2000. Following suit, in 2001 British Sugar took the decision to contract organic sugar from its British farmers, and, after sales had suffered due to limited demand, then acquired Billington’s, a small company importing unrefined cane sugars and market leader in organic sugar. The commercial rationale for organic is perhaps easier to discern than for fair trade: the organic label imparts a kind of ‘natural quality’ onto the product, adding value and allowing producers to charge more and thus cover the costs of lower yields and extra wages associated with an absence of chemical inputs. The price of organic sugar is typically double what is charged for granulated white sugar, compared to fair trade sugar which is priced at an equivalent level to the conventional market, and so it was anticipated that these sugars would constitute a small but profitable product line.1

In terms of carbon reduction, meanwhile, in February 2008 British Sugar became a pilot partner of the UK’s Carbon Trust in implementing its PAS 2050 carbon footprint method. Four months later, Tate & Lyle joined the work of the Carbon Trust and together the two became the first agri-food producers to work on this burgeoning international standard. The idea of PAS 2050 is to identify the emissions created in a product’s entire lifecycle – including the fuels needed to grow, process, package, preserve and transport the product – using a common, recognised and standardised approach. While the methodology and tool kit to measure emissions is publicly funded, through the Department of Energy and Climate Change and regional government, its implementation is privately funded, meaning that companies pay to certify themselves. This then allows them to use the Carbon Trust Footprint logo on their packaging and communications, and, in effect, advertise their environmental sustainability. Yet at the same time using the Footprint logo also locks them in to an ongoing commitment to reduce carbon emissions. Every two years the data has to be re-gathered and if the footprint increases, they lose the rights to the label.

Again it is worth asking why companies would agree to this expensive ethical concession. One part of the answer in this case is the fact that environmental impact had been a big issue with food

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1 Part of the extra cost also comes from the extra import duty paid on organics, since, in the case of Billington’s, the organic sugar came from Brazil.
manufacturers and retailers, and, for its part, Tate & Lyle needed to challenge the assumption that because cane comes from overseas it was particularly carbon intensive. In fact, the nature of cane production meant that it actually uses less fertiliser on the field, less machine haulage due to the use of animal and water haulage, and less fossil fuel in the factory since leftover sugar cane leaves can be burned for power. Moreover, the ‘food miles’ of shipping cane sugar to London for refining actually contribute very little to the product’s final carbon footprint. This knowledge provided the rationale for Tate & Lyle to hire a consultancy firm to do preliminary work on its carbon usage and then join the Carbon Trust initiative, since a common standard was preferred by producers and buyers across the economy. Tate & Lyle’s carbon footprint was ultimately measured at 380 grams of CO2 per 1kg bag of sugar. British Sugar faced the same buyer situation as Tate & Lyle but was aware that their carbon footprint was likely to be higher than their rivals. In this sense, they also had an incentive to pre-empt any ‘scare’ stories about their carbon intensity, as well as renew its claim as one of the best performing European sugar manufacturers should the footprint be significantly small. In the event, British Sugar’s footprint was measured at 600 grams of CO2 per 1kg bag of sugar – lower than many in the industry predicted.

On their own terms, then, these fair-trade, organic and environmental initiatives can each be seen as competitive responses by the UK sugar duopoly to changing consumer demands. As expressed by Simon Houghton-Dodd, Head of Quality and Sustainability at Tate & Lyle ‘there is no conflict between choosing to support trade with developing countries and seeking to minimise your carbon footprint’ (Tate & Lyle 2009b). On the face of it, this would seem to prove that consumers can shape markets and effect real change in the way companies do business. However, it is more accurate to label these initiatives less as market responses and more rubbing-stamping exercises. This is not the same as corporate greening, in the sense that they are used to mask more malign business practices, but rather a recognition that these initiatives essentially highlight existing business practices that are well-adapted to the new ethical terrain. The next step of the paper is to put these business practices into context, for when we look at the salient factors affecting the industry as a whole, we see that not only is this ethical turn epiphenomenal, in the sense that it is caused by the underlying business model of the respective companies but does not feedback into it, but also that it is incidental as a strategy the wider restructuring of the sugar industry.

**The Industry Context: Why the ‘Ethical Turn’ in Sugar is both Epiphenomenal and Incidental**

The first problem confronting UK sugar producers has been the shift toward healthier diets and a concomitant reduction in the consumption of food and drinks with added sugars. A general push toward reduced calorie consumption does not necessarily entail an attack on sugar. In the US during the early 2000s, for instance, low-fat dieting actually induced a recovery in sugar consumption since manufacturers of products like ‘lite’ mayonnaise, reduced-fat biscuits, or low-cal yoghurts merely bulked out their products with sweeteners instead of fat. Yet as illustrated in Figure 1, in the UK per capita consumption of non-milk extrinsic sugars (a technical term for added sugars) has fallen over the course of the last decade: from 64.8 grams per adult per day in 2000/01 to 62.2 grams per adult per day in 2008/09. Due to different data collection years, the consumption of UK children is not directly comparable, although it is notable that this also fell, from 77.6 grams per day in 1997 to 70.1 grams in 2008/09 (FSA various years).
Again, one needs to be careful here in assuming that a reduction in added sugar automatically implies a reduction in the market for sugar producers. This is because ‘sugar’ can also come from starch-based fructose and glucose sweeteners as well as sugar-based sucrose, and also because population growth can outweigh per capita falls. Nevertheless, in this case it does appear that changes in food and drink consumption are diminishing the market for refined sugar. Figure 2 shows that total UK demand for sugar has fallen from 2.53 million tonnes in 1990 to 2.06 million tonnes in 2009.

The specific nature of this fall lies with the reduction in the consumption of table sugar, sweet spreads and preserves – products with a high concentration of white sugar – by a third between 2001 and 2009. While this has been offset to a degree by the increased consumption of added sugars through soft drinks (especially by women) and alcoholic drinks (especially by men) it has not been enough to tip the scales (FSA 2009). Indeed, indicative of the healthy eating outlook is the fact that one of the biggest growth markets during the 2000s has been for low-calorie drinks, led in large part by increased sales among men for brands such as Pepsi Max and Coke Zero, masculinising and enlarging a market previously targeted at dieting women.
Two points can be concluded from these trends. First, retail sugars, that is the segment of production packaged by the sugar companies and sold on the supermarket shelves for home consumption, account for a declining proportion of total sugar sales: from 33% of sugar industry sales in the 1980s to 20% now. This puts the Tate & Lyle fair trade switch into context. The vast majority of its sugar goes into the ‘invisible’ industrial segment for use in manufactured foods, and thus only about 5% of the UK’s total sugar market is fair trade certified. The second point is that for the UK’s two sugar processors, growing company profits through increased sugar consumption in the UK looks decidedly limited. While the increasing proportion of their sales going into the industrial market may have cemented consumption (since it removes consumer control over how much sugar is used and what portion sized served) and while the companies continue to try and influence government strategy on obesity through their individual and peak association lobbying, at best all this can achieve is a ring-fencing of the existing market. At worst, the drop in food-based sugar consumption will turn into a secular decline.

In this respect it is notable that after years of reluctance to advocate a ceiling on sugar consumption, in 2005 the UK Department of Health has set a target to reduce the average intake of added sugar from its then level of 12.7% of food energy to 11% (DoH 2005). To promote this transition, the UK Food Standards Agency (FSA) has switched from a focus on reduced salt consumption to one of reduced calorie consumption, encouraging the food manufacturing industry to voluntarily reformulate specific food groups and make smaller portion sizes more readily available. Perhaps most worryingly for sugar producers, though, is the changing emphasis of the Food and Drink Federation (FDF), the association which lobbies government on behalf of food manufacturers and has long promoted the right of its members to ‘meet consumer demand’ for high-sugar products. The FDF has now begun to advocate the (financial) benefits of healthy eating and in a 2009 report entitled ‘Recipe for Change’, noted how its members have voluntarily embraced the challenge of lowering fat, salt and sugar content and are now ‘leading the way when it comes to the reformulation of popular products’ (Leech, FDF 2009). It went on to state that total sales of reformulated ‘healthy eating options’ are worth £8bn in the UK alone, and in some areas are growing at twice the rate of the market as a whole (Jago, FDF 2009).

The second problem confronting the sugar industry is high energy costs. The energy requirements at British Sugar’s four coal-powered beet processing factories accounted for 11% of their total UK-based costs while Tate & Lyle’s gas-powered refinery contributed £11m in energy costs (Tate & Lyle 2009a: 47). To alleviate dependence on these fossil fuel inputs both companies have invested in new energy provision. In 1997 British Sugar introduced Combined Heat and Power technology at two of its factories to make more efficient use of inputs. This is done by capturing the heat that is produced as a result of burning fossil fuels and finding a use for it. In this case instead of being released into the atmosphere the heat is piped into the UK’s largest glasshouse (27 acres) which is used to produce tomatoes. In fact, British Sugar is now the biggest supplier of UK-grown tomatoes, growing 190m a year.

Another benefit is that excess electrical power can be sold to the national grid. British Sugar’s factories at Wissington and Bury produce 70MW each, and, taking advantage of their existing connection to the grid are able to export 50MW of energy – enough to power a population of 120,000 people. Although this is a relatively small amount (the coal-based Drax energy producers export 2,000MW for example) not only does it provide an effective hedge against future energy prices rises, but it also allows the company to qualify for an 80% discount on the Climate Change Levy and to sell carbon credits through the Emissions Trading Scheme (ABF 2009). For its part, in 2007 Tate & Lyle announced plans to introduce a new £20m biomass boiler at its refinery which will provide 70% of its energy needs by burning imported biomass and also allow the company to supply electricity to the

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2 British Sugar and Tate & Lyle are members of the Sugar Bureau and the Food and Drink Federation. The Director of the UK’s Sugar Bureau, Dr. Richard Cottrell, has publicly opposed any government campaign to reduce sugar levels. "I would question the justification for focusing on sugar. There is no evidence linking increased sugar intake with obesity. What we need to do is make people understand the importance of variety in the diet and our major focus in this country should be on getting people to do more physical exercise" (Beverage Daily 2004).
grid. Once it is fully operational, the biomass boiler will reduce the refinery’s carbon footprint by more than 20% (Tate & Lyle 2009a).

In terms of reducing the carbon footprint of sugar, these energy investments are complemented by increasing agricultural yields as producing a greater output *ceteris paribus* necessarily reduces per unit carbon intensity. Since 1980 British Sugar has doubled the amount of sugar it produces per hectare whilst at the same time reducing nitrogen fertiliser and pesticide use. The effects of this on farm employment can be seen clearly in Figure 3. As farmers produced ever more sugar, and as EU quota rules have only allowed a set amount of sugar to be sold at high fixed prices, the conditions arose for the company to decommission the smaller, more costly factories and contract beet from fewer farms. In this respect, signing up to Carbon Trust can be seen as part of a longer campaign to increase farm- and factory-level efficiency irrespective of consumer concerns. The main incentive for this efficiency drive has been to reduce costs in order to meet the key requirements of industrial sugar-users – which remain low price, high quality and secure supply – and thereby convince shareholders that, notwithstanding the weakening demand for refined sugar in the UK, opportunities remain to increase profit margins in this market.

Figure 3

![Number of Farmers in UK Sugar Beet](image)

The third and final problem facing the UK sugar industry, and indeed the EU industry at large, is the threat of import competition. For reasons of trade diplomacy and industrial development, the European Commission has for a long time tried to fit the anomalous EU sugar regime – what Barry Gardiner, Parliamentary Under-Secretary of State for DEFRA, called the single most distorting and protectionist element of the whole Common Agricultural Policy – into this wider system (Parliamentary Note 2009). By shifting from a system of quotas and high tariff barriers, which essentially keep the EU price of sugar above the world price and allow producers to pass the costs onto consumers, the Commission and many others believe that the ability of the EU to negotiate more ambitious trade agreements and the ability of its processed food and drink exporters to be more competitive will be enhanced.

The first step toward breaking the stranglehold of EU sugar producers came in 2001 when the Everything But Arms agreement was signed. This allowed the 48 Least Developed Countries (LDCs) to export all products apart from arms and munitions into the EU without facing any trade barriers. While the EBA did not cover any countries that could have flooded the EU market immediately – no LDC was a major exporter in the league of Brazil, Australia or Thailand – the EBA constituted the thin end of a wedge for European producers. This much was recognised when sugar was made one of
only three commodities denied immediate access under the agreement and instead backloaded until 2009. The other legislative step toward a more liberal regime was the decision of the EU in 2006 to lower the guaranteed price in the region by 36%. This meant production would fall and so its export surpluses would disappear, thus complying with the WTO ruling following a complaint bought by the big sugar exporting countries mentioned previously, and also that the EU would be made less attractive to the new EBA-eligible exporters, which otherwise might have flooded the market and destabilised prices.

Before this wave of reforms to the EU sugar regime, sugar beet was produced in 23 of the 27 Member States. Now, 5.8 million tonnes of EU sugar quota has been discontinued and the European industry is concentrated in just six states – France, Germany, Poland, UK, Netherlands and Belgium. Moreover, not only are exports from the EU restricted to 1.4mt, but, since 2009, the LDCs have been free to export into the EU without constraint. Thus the economic geography of EU sugar supply has been recast and the scene set for even further reform. In a speech reflecting on the recent changes to the EU sugar regime, for instance, Klaus Dieter Borchardt, speaking on behalf of the EU’s Agricultural Commissioner, alluded to the fact in the next round of reform, the industry should prepare itself for an end to the quota management system, an instrument used to regulate prices since the regime’s inception in 1974 (Borchardt 2009). It is this looming threat of unfettered commodity competition that is crucial to identifying and understanding the actions of the UK’s sugar processors.

Constructing and Capturing Secure Markets: White Bio-Technology and the Futurity of Sugar

Two main avenues, or planes of accumulation, have been targeted by our case study companies as routes to future profits. They are penetration of expanding developing country markets in sugar, on the one hand, and the graduation into developed country markets in functional foods and renewable energy and materials, on the other. In 2007 British Sugar bought a controlling stake in the South African sugar cane producer Illovo, a company which has low-cost production bases in a number of LDCs in Africa, and, in 2009, also bought a stake in the Spanish refiner Ebro. The fact that it has also established a trading company called Mitra has made clear the intention of the company to shift the balance of its EU supply chain toward imported cane. Indeed, it has even conducted feasibility studies to ship raw cane into the UK and refine it in its existing beet factories during the off-season. Likewise, in 2007 Tate & Lyle acquired a 10% stake in a joint venture with the biggest Asian sugar manufacturer, Thailand’s Mitr Phol Group, to develop a sugar producer in Laos. As Laos also has LDC status, it was able to ship its cane to Tate & Lyle’s refinery duty-free.

Along with vertical integration of their international trade operations, these companies have also invested in sugar-producing capacity in developing countries targeted at the domestic market. British Sugar produces 0.85mt sugar in China, around 5% of the country’s total, and since the late 1990s, Tate & Lyle has been producing sugar in Vietnam, again in conjunction with Mitr Phol (ABF 2009; Tate & Lyle 2009a). Crucially, these are two countries in which sugar consumption is increasing dramatically: 68% in China and 82% in Vietnam between 1998 and 2008 (F.O. Licht 2008). These are two of the fastest growing in Asia, and despite their low starting base, or perhaps because of it, are deemed ‘market[s] with a future’ by the companies involved (Food Navigator 2009).

In this sense, then, the sugar industry would seem to fall into Lawrence and Burch’s (2010) critique of food corporations as reconfiguring their activities in the Global North toward healthier products whilst simultaneously manufacturing and selling products of dubious health benefits to the South. This is particularly apposite for Tate & Lyle, which has been undergoing a profound divestment of its commodity-producing facilities. Over the last decade the company has sold its shares in sugar refineries in Canada, Egypt, Mexico, Saudi Arabia and the US, leaving only its Portuguese, UK and Vietnamese ownership intact. It has also sold off a large part of its European starch processing business. These decisions form part of the company’s re-orientation from the production of bulk commodities and toward value-added ‘renewable food and industrial ingredients’; a re-orientation which has involved the increased application of ‘white’ bio-technology (Tate & Lyle 2009).
Bio-technology is understood here as the application of techniques that intervene at the molecular or cellular level to transform life processes for human purposes (Mulvaney and Wells 2004). It can be split into four different sub-fields: green bio-technology used in agriculture, blue bio-technology in aquaculture, red bio-technology in medicine, and white bio-technology in industry. Most scholarly research on the agri-food sector has focused on green bio-technology and its application in the development of chemically-resistant crops or animal growth hormones. By contrast, the practice of white bio-technology – used to produce chemicals, materials and fuels based on the fermentation and then catalysis of living cells and/or their enzymes – has been less well documented. In many ways this is surprising. White bio-technology has been prominent in the global food system since the 1970s, with the development of High Fructose Corn Syrup, a sweetener made by processing corn starch into glucose syrup and then transforming that syrup into fructose using enzymes. As a cheaper substitute for sugar, HFCS was able to take a large slice of the US and Japanese sweetener market and thus demonstrated the lucrative possibilities for white bio-technology in food manufacturing.

The financial gains for white bio-technology are now more closely aligned with the provision of functional foods (foods that contain health benefits beyond their traditional nutrients) rather than direct dietary substitutes. While most analyses have focused on final food manufacturers such as Nestle or Kraft or retailers such as Tesco with its ‘Tesco Healthy Living’ range, the opportunities available to ingredient manufacturers should not be overlooked (Lawrence and Burch 2010). For instance, the products that Tate & Lyle’s could feasibly supply in its core market of sweeteners, texturants, and wellness ingredients were estimated to be worth £6.4 billion (Tate & Lyle 2009a). The main product developed by the company to this end has been sucralose, a reformulated version of sugar that has chlorine added to it so that it is not metabolised by the body and is therefore ‘low calorie’. This was launched under the brand name Splenda in the US in 2000 and in the UK two years later, and now sweetens over 4,000 products worldwide in the food, beverage and pharmaceutical markets. As an illustration of its importance to the company, while sugar contributes 29% of Tate & Lyle’s total revenue and just 4% of adjusted operating profit, sucralose contributes 5% of revenue but a substantial 23% of profit (Tate & Lyle 2009a).

Following the success of Splenda, Tate & Lyle have developed proprietary enzymatic processes on other products to be sold in the EU, including its Promitor dietary fibre, a tasteless ingredient added to foods to improve digestive health, and its Sta-Lite polydextrose, a low-calorie bulking agent used in no added sugar foods. Moving into non-food products, it also developed a propanediol called Bio-PDO from corn sugar, a product used in cosmetics, detergents and anti-freeze.

To encourage food manufacturers to use these novel ingredients in their products, Tate & Lyle have also invested in what they call ‘proprietary consumer insight research’. For instance, one of its recent surveys concluded that most consumers check the nutritional information on-pack, that many feel that their diet is lacking in fibre, and that 80% would be prepared to spend more on products that claimed they could help control cholesterol (NPI Center 2009). Unsurprisingly, these findings reinforce to its customers the perception that final-end consumers are demanding the kind of ever more sophisticated foodstuffs that Tate & Lyle’s products can be combined to engineer. The job of developing these products, meanwhile, led to the creation of a €4m Wellness & Nutrition Centre, established by Tate & Lyle in France in 2007. The centre includes laboratories and pilot plant facilities for customers, with a team of nutritionists giving guidance to the in-house research group. Its aim is run pre-clinical and clinical research projects, in order to uncover and validate the nutritional benefits of the company’s ‘wellness’ products (Tate & Lyle 2009c: 18).

Reflecting its background in crop cultivation and processing, British Sugar has instead targeted renewable fuels as a means of shifting the economic locus of its business. The regulatory imperative for this has been set by the UK’s commitment to legally binding targets under the EU’s Renewable Energy Directive for 15% renewable energy by 2020, including 10% bio-fuels, and the Fuel Quality Directive for a 6% cut in GHG emissions by 2020. Ethanol produced from sugary and starchy crops such as sugar beet or wheat, along with bio-diesel produced from oily crops such as rape, are the ‘first generation’ bio-fuels tasked with meeting this demand. The fit with British Sugar’s operations was
heightened by the company’s need to find another outlet for the surplus sugar beet that would be difficult to dispose of following EU reform, and thus it decided to build an ethanol distillery onto its existing beet processing factory at Wissington (55,000 tonnes or 70m litres). Then, in 2007, it announced plans for a much larger ethanol plant (330,000 tonnes or 420m litres) to be built in Hull in conjunction with BP and DuPont. Costing £200m, with £60m of finance provided at an attractive rate to British Sugar by the European Investment Bank, under full production the plant is anticipated to take the company’s share of the UK bio-fuel market to roughly one third. Another possible renewable fuel being considered by the company is bio-gas, which could be recovered when treating its effluent waste. According to the Mark Fairbairn, Executive Director of the National Grid, this is a technology which ‘is about to see its day’, and which could provide ‘nearly half Britain's heating needs by 2050, as a green alternative to natural gas’ (Allianz News 2009). As illustrated by this quote, what is so crucial about these new markets is that they contain an expansive quality to them; it is not profit *per se* which is important but the opportunity for growth.

Underpinning this transition has been public and private investments joined around the idea of a green economy, serviced by the ‘integrated bio-refinery’. Similar to petroleum refineries, but using biological inputs such as sugar beet or cane, the bio-refinery is designed to produce transport fuels, chemicals, heat and power. The production of food, while possible, is seen as incidental in the wider purpose of these facilities. In this respect the UK’s main public funder of bio-science research – the Biotechnology and Biological Sciences Research Council (BBSRC) – has invested over £30m in research aimed at increasing the yield and quality of ‘second generation’ bio-fuels from food waste and non-food crops. British Sugar is well placed to prosper through such innovations and have taken an active role in their development. Karl Carter, Director of Technology at British Sugar is Chairman of the Integrated Bio-refining Technology Initiative, and a member of the Industrial Biotechnology Leadership Forum, responsible for directing government strategy in this sector. The main policies promoted have been government support for demonstration projects, a straight line trajectory for renewable fuel usage, duty drawbacks for suppliers of bio-fuels and the global application of sustainability standards. In effect, this would ensure that UK and European policy-makers remove the risk attached to market development by boosting demand and insulating domestic producers from (what they claim as) unsustainable imports.

**Conclusions**

This paper began by noting the politicisation of the agri-food sector in terms its negative impacts on public health, rural livelihoods and global warming. Led by changing consumer demands, the emergence of alternative food networks were reckoned to pose a challenge to food manufacturers and farmers alike, encouraging them to move toward less intensive and more socially acceptable forms of production. At first glance, the UK sugar industry appears to fall squarely into this narrative. In the last few years the two big producers, British Sugar and Tate & Lyle, have both made commitments to produce organic and/or fairly traded sugar whilst also lowering their carbon footprint. However, a longer look suggests, first, that these initiatives are mere rubber-stamping of existing business practices, and, second, that they divert us from the more significant financial and political changes being enacted within the sugar industry.

Structuring these changes has been the decline in the consumption of sugar, high and unpredictable fossil fuel costs, and the threat of increased sugar cane imports and deregulated prices. Together these have encouraged sugar processors in the UK to turn away from bulk sugar production in the developed world, or, more precisely, to recognise this commodity as providing opportunities to ‘rescue’ a variety of by-products from the production process and a technological and infrastructural platform by which it can move into more expansive markets. Emblematic of this new environment and its commercial possibilities at the global level is the Coca-Cola ‘Plant Bottle’. This a recyclable bottle made from 30% sugar-derived plastic rather than wholly petroleum-derived plastic, and two billion are anticipated to be in circulation by the end of 2010. When touted under its Coke Zero brand at the Copenhagen Climate Change Summit in 2009, it neatly illustrated the paradigm shift alluded to in this paper: sugar used on the outside of foods rather than on the inside.
Three main conclusions can be drawn from this analysis. The first relates to our conceptualisation of the conventional and alternative divide in the agri-food sector. While Sonnino and Marsden (2006) note the extent to which this boundary is porous, as companies move in and out of the various models, the distinction in this reading does still exist. In other words, alternative food networks evolve and mutate within the context of the conventional sector but always retain a separate identity. In the case of the sugar sector, this distinction cannot be upheld. The same companies produce both fair trade and plantation-grown sugar, organic and industrial sugar. Perhaps this is unique to this industry, a reflection of the difficulty in differentiating a highly processed product in a highly concentrated market. Yet it still begs the question to what extent we can speak of an alternative food network if it is ultimately directed by and beneficial to the ‘conventional’ corporation?

The second conclusion relates to corporate policy and the changing nexus of accumulation. By targeting functional food and renewable non-food markets through white bio-technology, sugar processors have sought to widen the number of markets into which they can sell. This fits closely with the analysis of Boyd et al. (2001), who note that, within the literature on agri-food systems, nature has been typically understood as a series of obstacles or constraints, and less so as opportunity. They use the concept of real subsumption, whereby capital is made to circulate through nature rather than around it and thus systematically increase biological productivity (i.e. yield, turnover time, metabolism, photosynthetic efficiency) to capture the way in which biological systems are made to act as actual forces of production. In short, capital makes nature work harder, better and faster. What is notable in our case is that by pursuing a strategy in tune with ecological modernisation, in particular the replacement of fossil fuel-derived products with biomass-derived products, sugar processors have made nature work further. In effect, they have sought to replace dead carbon with living carbon, a process that has a profoundly political dimension to it. The prefix ‘bio-’ is used as part of a discourse of legitimisation and users of white bio-technology have been highly active in preventing it being contaminated, most notably in their defence of bio-fuels. In instances where criticism has been made of corn ethanol in the US or palm oil in Indonesia, these companies have been vocal in the fact that critics need to discriminate according to the feedstock, country, or company involved, in order to prevent blanket condemnation of the project as a whole and a withering of state support for the fragile bio-fuel industry (see Raymond 2008).

The third and final conclusion traces the impact of this shift back to the farm level. What impact will this have on employment and revenue? From the perspective of processors, the integrated bio-refinery has greater adaptability on the feedstock it can run on. The new currency is not sugar beet, wheat or corn but sugars – a deconstructed chemical constituent of starch – and in this respect they have greater room for manoeuvre in playing farm suppliers off against one another. From the perspective of industrial users, meanwhile, as white bio-technology moves from fine chemicals and eventually into bulk renewable products, feedstock prices will become an ever more important issue. DSM, for instance, a prominent chemical manufacturer, has outlined in a policy paper that ‘the current price levels of renewable feedstocks for the fermentation industry exceed the prices of feedstocks used by the bulk and petrochemical industry….Moreover, current EU agricultural trade policy measures maintain the price of sugar at a level, which is higher than the world market prices’ (DSM Industry Position Paper 2004: 7). This constitutes another downward pressure on farm gate prices, and, crucially, a new source of discursive power to justify it. For instance, British Sugar (2008) have already promoted the fact that the area dedicated to sugar beet production for food and fuel was ‘40% lower than it was 10 years ago when only food was produced’. As long as cheap sugars can be sourced from somewhere, there is little need to support the farmers behind them.
References


Tate & Lyle (2009c) Sweeteners Brochure (London: Tate & Lyle).

