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CSaP centre for science and policy

Centre for Science and Policy
Policy Workshop

Global Food Security and Cambridge Public Policy Strategic Research Initiatives

Monitoring the global food system: building trust and resilience for UK citizens and consumers

GLOBAL FOOD SECURITY

A summary of the discussions held on 13 September 2017

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Acknowledgements

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Introduction

Purpose of the workshop

This workshop brought together policy officials from the Food Standards Agency, the Environment Agency and Defra with experts on business and enterprise; plant sciences; rural and environmental economics; diet and activity; and innovation, health and science.

The purpose of the workshop was to provide participants with an opportunity to share their latest research and policy insights on food security issues. The workshop addressed questions posed by the Food Standards Agency (FSA):

1. What potential shocks to the global food system should the UK Government be monitoring?
2. What do we know about how markets, firms and consumers respond to shocks and emerging risks in food systems?
3. How can horizon scanning extend beyond a focus on technological change to include social and economic dynamics?
4. How should monitoring and analysis pay attention to weak signals and complex data?
5. How can advances in data science be harnessed?
6. How can consumers and citizens engage in foresight and scenario work?

Summary of discussions

Discussions focused on the future of UK food regulation in a globalised food system; in particular what capabilities the Food Standards Agency (FSA) and other parts of government will need in order to support the long-term resilience of the food system as it affects UK citizens and consumers.

Topics covered included: the role of the FSA and its accountability to the consumer; the role of the consumer and the market in food security; methodological and technological approaches to solving food security problems; and the role of experts and trust in food security.

1. The FSA and its accountability to the consumer

The FSA is a non-ministerial department responsible for food safety and food hygiene in England, Wales and Northern Ireland. It works with local authorities to enforce food safety regulations.

The FSA's programme *Regulating our Future: why food regulation needs to change and how we are going to do it* aims to modernise an unsustainable regulatory approach. The existing 'one size fits all' approach is ill-suited to the increasingly diverse nature of the industry – whether online retailers, food delivery services, private auditors, food safety certification schemes. And we see the scale of global change impacting the food system – whether climate change, geo-political and economic shifts, through to technology innovation. But the current regulatory approach doesn't allow us easily to focus our effort on changing risks.

2. The consumer and the market

Consumer preferences and the purpose of the market-led food industry

Food security policy acts on behalf of the consumer. However, different views were debated regarding what constitutes acting on behalf of the consumer, and the consumer's preferences regarding food policy.

One view put forward was that we should take the buying actions of consumers to be their revealed preferences. In this case, the food industry could be viewed as acting on behalf of consumers by meeting their demand for foods with (for example) high salt and sugar content.

An alternative view was that, since foods that are high in energy density provide better value per calorie than, for example fruits and vegetables, the most cost-effective way to feed hungry mouths is not necessarily the heathiest. This is a perfectly rational response, if one predicated by a short-term view.

It is also apparent that the food industry is designed to maximise profits, rather than to truly meet consumer preferences. Maximising shareholder value does not necessarily maximise societal value. The maximisation of profits is achieved via the manipulation of demand via marketing. Maximising profit usually requires maximising sales of relatively low margin but high volume products. Such products tend to be convenient but less healthy (e.g. sugary drinks and ready meals).

The key challenge here is that the primary goals of the food industry (maximising shareholder value) and public health (maximising health and minimising health inequality) are poorly aligned. To maximise achievement of both goals will require a paradigm shift by the food industry – away from a purely market-led approach – that also takes account of health as a value. Poor health (e.g. from non-communicable disease consequent upon an unhealthy diet) is an external cost of the food industry that needs to be internalised.

Evidence that the consumer does care about the healthiness of their food can be seen in the response of the British public to two food scandals – BSE and the 2013 horse meat scandal. With regard to BSE, beef sales have not returned to the levels seen pre-March 1996 (when the European Commission imposed a worldwide ban on all British beef exports). With regard to the horsemeat scandal, the adverse reaction of the public was fervent.

Whether this can or should extend to manipulating the market remains open to question.

Changing consumer behaviour

Behavioural ('nudge') economics offers another set of tools for viewing and manipulating the relationship between consumer preferences and the market – although it does not necessarily stand in opposition to either preceding view. This approach to intervention achieves its goal by changing the 'choice architecture' of, for example, retail environments (e.g. by changing the placement of healthier or less healthy foods). It can be successful because human behaviour is dictated not only by conscious, but also by unconscious or automatic decisions.

We know that habit and imitation both play a role in consumer behaviour, and both seem to be perfectly rational heuristics. However, behavioural economics tells us that if we change our incentive structures slightly, we can get the public to alter their behaviour. The default effect may be of use here. Making one option the default increases the probability that it will be chosen.

It was pointed out that individuals play a dual role both as consumer and citizen. Each role comes with corresponding preferences. The consumer prefers cheaper products, but the citizen appreciates collective action for a positive goal (reducing climate change for example).

Mike Barry, head of sustainability at M&S, has stressed that any change made in consumer preferences must be cultivated over a long period of time. An example of this is the very gradual reduction of salt in M&S products (whilst informing the consumer). Anything other than a gradual shift could lead to consumers switching brands. This approach can be successful because our innate preference for salt and sweet tastes can be reset.

The role of public figures, such as Jamie Oliver, and movements such as the organic and in-season movements in changing consumer preferences in a healthy direction is not to be overlooked.

The opinion that retailers could persuade consumers to adopt an in-season mentality, was put forward as a way of reducing the environmental cost of importing produce. However, some scepticism was presented with regard to the number of consumers that could be persuaded to adopt this mentality. For many, the pleasure they get from eating (for example) asparagus out of season, might be enough to overlook the environmental cost.

There is an asymmetry between the consumer and food manufacturers and retailers regarding the level of information to which they have access. Consumers have substantially less information regarding the health risks that ingredients in, say, soft drinks pose to them. Furthermore, the power to change the food industry systematically lies in the hands of businesses rather than the consumers. So the level of responsibility which the consumer has is far smaller than that of business.

Food markets and classical economics

We know that markets do not necessarily respond to shocks and emerging risks in line with the principles of mainstream economic theory. Food markets are typically characterised by market failure. There is an asymmetric distribution of information between the consumer and the trader (in favour of the trader). They are also characterised by externalities – costs or benefits of transactions (on individuals or society) that are not overtly part of the transaction (i.e. hidden). Food markets are not, therefore, 'competitive markets' in the classical sense, because they do not have to pay for the external costs (e.g. health care or lost productivity resulting from the health damaging effects of unhealthy foods.

The responses we get from such markets are those that mainstream textbooks would call "irrational". However, this is not the case. They are perfectly rational, as they reflect the market conditions in which those decisions have been made. For example, an increase in food prices is not necessarily a response to commodity shortages; it may be a response to commodity hoarding. For those with a controlling interest in a commodity, hoarding it to drive up the price is rational behaviour.

Food waste

Approximately 30% of food is wasted in both the 'developed' and 'developing' world. The waste happens at different stages of the food chain in high, middle and low income countries.

In India, food waste happens in large part because of the lack of a cold chain (a temperature-controlled supply chain). It is large companies that provide the infrastructure needed to reduce waste early on in the supply chain.

Farmers in developing countries also lack timely information regarding crop prices and markets. This creates price fluctuations. In the UK, waste happens mostly at the retail and consumer end of the chain. Retailers fear empty shelves; empty shelves could lead not only to lost sales, but also to lost customers. The fear drives overproduction and oversupply. Supermarkets overstock to avoid this problem. The result is either the dumping of large quantities of food, or reduced price deals (e.g. two for one offers).

Human bias can lead to overstocking. Confusion caused by use-by and sell-by dates can also result in consumers throwing away perfectly edible food. The aesthetic bias that consumers have against misshapen fruits and vegetables also leads to waste at the farm end of the chain. This bias has been systematically encouraged by the food industry, and supermarkets in particular (the worst culprit having been M&S). Some supermarkets have found other ways of using misshapen fruits and vegetables. Sainsbury's for example, reduce waste by utilising misshapen fruits and vegetables in sliced food ranges and ready meals. Other supermarkets have re-introduced misshapen fruits and vegetables with specific marketing appeal (e.g. Tesco's 'perfectly imperfect' range).

The Walmart phenomenon

A case study highlighted the effect of Walmart opening and closing a store in a rural, low income community in the USA. Prior to Walmart's opening, the community grew their own food and had a sense of community.

Walmart's ability to save costs by increasing their level of production (to leverage economies of scale) resulted in a reduction of costs to the consumer which meant that Walmart became the only source of food and livelihood for the community.

When the store decided to close, the effect was devastating. The community had become wholly reliant on a business that was not focused on food security and in only a short period of time (10 years) had lost its own means of food production.

3. Methodological and technological approaches

Various methodological and technological approaches to solving food security problems, were discussed.

Antimicrobial resistance research

The challenge of antimicrobial resistance exemplifies the complexity of food security problems. Antimicrobial research has given us some knowledge. We know that: (1) it occurs naturally; (2) overuse and misuse of antibiotics exacerbates the problem; (3) resistant genes spread between people, between animals, and between people and animals.

However, what we know is eclipsed by what we don't, and our understanding changes almost daily.

Recent research has investigated cases in which aquaculture systems – which had either not used antibiotics for years, or had never used them – still had sediment carrying bacteria with resistant genes. Some testing revealed that the resistant genes were coming from the fish food.

There is also a worrying trend in the use of antibiotics in animal feed in Chinese farms. Feed is chosen if it produces the most rapid rate of growth in the animals (a function of the amount of antibiotics in the feed). Neither the presence, nor identity, of the antibiotics appear on the labels for these feeds. Improved monitoring and surveillance could be useful in this instance.

Blockchain

Blockchain has the potential to change the way we buy and sell, interact with government and verify the authenticity of everything from property titles to organic vegetables. It combines the openness of the internet with the security of cryptography to give everyone a faster, safer way to verify key information and establish trust.

Blockchain could be standardised across borders and has the potential to aid with monitoring and surveillance. It is also a very tamper resistant, permanent register and does not rely on a single entity to maintain it. It is a shared database with mutual control over the evolution of data.

There are already a number of food security projects utilising Blockchain including IBM's collaboration with Nestle, Unilever, Walmart and Provenance.

Sweatcoin is part of a growing trend in digital fitness apps that offer rewards for exercise. Apps such as Bitwalking and Gympact also pay users in virtual currency, while Charity Miles turns steps into donations for charitable causes. A possible use of these currencies would be for employers (who pay for their employees' healthcare), or national health services, to partner with these organisations to incentivise people to walk to work. Any virtual currency earned could be converted and paid alongside salaries. Any expense on employers and national health services would be offset against the cost of healthcare. A similar type of app (and partnership scheme) could be developed for healthy eating.

There is the possibility for Blockchain based RegTech (regulatory technology) to aid regulators gain access to the workings of an industry. Since Blockchain is a network of computers sharing information, a regulator could be offered a node within that network. This would help with monitoring and surveillance.

An issue with Blockchain is the 'garbage in garbage out' problem – inaccurate or fraudulent information which can render a Blockchain worthless. Companies like Everledger, which uses Blockchain for tracking diamonds, have made progress on this problem by putting unique codes into its diamonds which are then linked to the Blockchain.

Smart contracts stored on the Blockchain could be used to aid the food system. Smart contracts can verify that an event has taken place, and automatically carry out an action in response. For example, a smart contract between an airline and individual could verify that a flight is cancelled and automatically issue a refund.

Privacy is an issue. Some Blockchains can be designed to be more private than others.

Citizen science methods and technology

Citizen science is the engagement of non-scientists in scientific and data gathering projects.

It was proposed that government-driven citizen science projects allow for the possibility of achieving three positive outcomes at once:

- Getting a better, more immediate data set
- Opening up the data to the public, thereby increasing consumer trust
- Increasing consumer engagement, and thereby consumer understanding

Such projects are in keeping with the FSA's goal of empowering the consumer.

One example which could act as a blueprint for food security citizen science is *Premise*. *Premise* is a business which utilises paid citizens to capture real-time economic data with smartphones. This data is sent to a central server where it is utilised to spot trends and anomalies.

Where's George? is another example of a citizen science project, which tracks one dollar bills. This could include attainment of local knowledge more generally.

Data science and data driven businesses

A way of improving the monitoring and surveillance of the food supply chain is to scale up our existing systems, including the data systems that support them.

There is potential for data science to be utilised as a tool for cutting food waste. Due to retailers' fears of having empty shelves, they work with a number of farmers and sometimes will renege on their contracts to avoid too much overstocking. This can result in farmers being left with food which goes to waste. Data science could be used to predict variations in supply and demand more accurately, and therefore avoid waste.

Data driven businesses could also increase the accuracy of predictions concerning consumer

behaviour (thereby reducing shocks to the system), and nudge consumers in the direction of healthy eating. For example, Gousto is a business which delivers healthy ingredients and meal plans straight to its customers' doors. It uses a machine learning recommendation engine (utilising millions of data points), which predicts customers eating habits, and offers recipes on the back of these predictions.

It was stressed that there were reasons to be sceptical about the effectiveness of data science in solving food security problems. An analogy with chemical analysis was used – if you know what you are looking for you could find it but if not, you could easily miss it. However, data science has proved incredibly useful at identifying trends that we didn't know we were looking for – that's its strength, posting unexpected trends.

Locating drivers of potential shocks to the global food system as a method of horizon scanning

This method of horizon scanning involves listing areas in which shocks to the food system might arise. These include:

- **Conflict**: Although the threat of conflict seems far removed from our shores, conflicts frequently happen and could affect the UK's food supply chain e.g. the hypothesised causal link between Arab spring and drought in Russia.

- **Consumer reactions to new technology and methods:** For example, Europe reports greater levels of concern regarding genetically modified foods than the USA or Asia. Another (potential) example is the increased use of emulsifiers in the food industry which lead to greater caloric density. If this plays a substantial role in obesity we might expect a consumer backlash.

- **Disease**: For example, avian influenza in poultry populations has highlighted that different approaches for disseminating biosecurity information may be required for different types of farmers and others who keep animals, including backyard chicken populations.

- **Surety of supply – confidence in the supply chain:** This is linked to affordability and volatility in price. The UK's exit of the European Union is likely to bring not only volatility of exchange rate, but also volatility of supplies and prices.

A distinction was made between shocks to the food system and stresses. A shock to the food system is an abrupt, episodic event (e.g. the shutdown of a food supply route due to a military conflict). Whereas stress to the food system is a sustained pressure to the food system (e.g. soil erosion).

Recent research by Dr Emily Shuckburgh[1] has focused on trying to assess risks to systems, including the food system, from climate related shocks. Several challenges were encountered during this research: the first was the problem of accurately mapping the supply chain; the second was the problem of trying to understand the links between climate related shocks and the actual impact on food systems.

An example of the second problem comes from Dr Shuckburgh's project investigating milk supply chains in Egypt. A severe heatwave is a climate related shock that might be expected to adversely affect milk production, but the reality proved more complex. Local knowledge led to an understanding that in times of heat stress affecting bovine milk production, Egyptian milk supplies are often sourced from camels, providing greater resilience than anticipated based on studies from other parts of the world. The need for local knowledge and citizen involvement is therefore crucial for overcoming this second problem.

Another crucial tool for solving the second problem is understanding correlated risk. We need to understand the correlation between individual risks if we are to understand the aggregate risks to the system.

[1] http://www.csap.cam.ac.uk/network/emily-shuckburgh/

Defra has talked of keeping agricultural subsidies which account for ecosystem services, but abolishing acreage payments and production subsidies. Acreage and production subsidies have had the effect of increasing European food prices above those in other world markets. However, they have also led to increased stability of food prices in Europe. If we end up working under the rules of the World Trade Organisation, there will be much higher instability of food prices.

A briefing document by Millstone *et al* on food security and UK's exit of the European Union can be downloaded here: [1]*A Food Brexit: Time to get real*.

Experts and trust

There is a need for an understanding of the value that each expert brings to the table. Experts must be credible. There are potential conflicts of interest concerning the links between business and scientific research.

A worrying phenomenon within the food industry is the attempts of businesses to "own" scientists. For example, recent research has shown that in general, saturated fatty acids from dairy (and plant) sources can be healthy, whereas those from meat are not – in contrast to the prevailing message since the 1960s that all saturated fats are unhealthy. The Cambridge scientist who produced this research, Dr Nita Forouhi[2], has since been bombarded with requests by businesses in the dairy industry to validate their own research.

There is a need to develop an international consensus regarding what is the appropriate relationship between the researchers and the food industry. A recent systematic review undertaken by Professor Martin White[3] yielded 56 principles for avoiding conflicts of interest. These principles have been used in a Delphi survey to achieve international consensus[4]. An international workshop in 2018 aims to produce guidance for the research community on working with the food industry.

Questions regarding confidence in experts could be reframed in terms of trust. Consumers need to be able to trust regulatory bodies working on their behalf. It was highlighted that the FSA's General Advisory Committee on Science had provided advice regarding the appropriate attitude to minority expert views: *"We recommend that committee decisions should include an explanation of where differences of opinions have arisen during discussions and why conclusions have been reached, even if alternative opinions were expressed."*(Full text available here[5]).

It was argued that science by itself cannot create policy. You cannot derive an 'ought' (a policy decision) from an 'is' (a scientific fact). Facts do not determine our values, and policy decisions are about our (collective) values.

The appropriate role of scientific experts is to provide advice regarding what is known and not known about the consequences of following (or not following) a range of different policy actions. Any policy decision should be made by those who are democratically accountable to the public.

[1] http://www.sussex.ac.uk/spru/newsandevents/2017/publications/food-brexit
[2] http://www.mrc-epid.cam.ac.uk/people/nita-forouhi/
[3] http://www.cedar.iph.cam.ac.uk/people/leads/martin-white/
[4] http://www.cedar.iph.cam.ac.uk/research/dietary-public-health/food-behaviours-public-health-interventions/diet-research-food-industry-project/
[5] https://gacs.food.gov.uk/sites/default/files/mnt/drupal_data/sources/files/multimedia/pdfs/committee/gacsint002.pdf

Although this view was supported, not everyone's experience of providing scientific advice for policy was in keeping with the bleak view that some scientific advisers solely offer prescriptive advice in favour of one policy decision.

The case was made that future food policy meetings might benefit from having an expert in the supply chain. The food system has multiple, uncoordinated, points of regulation: health, nutrition, production standards, international trade etc. The different regulatory bodies which coordinate these different aspects of the food system are not naturally going to be joined up. We may need some regulation to ensure this.

Attendees

- **Dr Robert Doubleday** (Chair) Executive Director, Centre for Science and Policy
- **Dr Jon Freeman**, Research Group Director, Innovation, Health and Science, RAND Europe
- **Jacqueline Garget**, Coordinator, Cambridge Global Food Security Strategic Research Initiative
- **Professor Howard Griffiths,** Professor of Plant Ecology, Department of Plant Sciences, University of Cambridge
- **Dr Garrick Hileman**, Centre for Alternative Finance - Senior Research Associate, Judge Business School, University of Cambridge
- **Professor Ian Hodge**, Professor of Rural Economy, Department of Land Economy, University of Cambridge
- **Professor Erik Millstone**, Professor in Science and Technology Policy, University of Sussex
- **Julie Pierce**, Director Openness, Data and Digital, Food Standards Agency
- **Professor Jaideep Prabhu**, Jawaharlal Nehru Professor of Indian Business and Enterprise, Judge Business School, University of Cambridge
- **Dr Emily Shuckburgh**, Head of the Open Oceans Research Group, British Antarctic Survey
- **Dr Elta Smith**, Associate Director, Innovation, Health and Science, RAND Europe
- **Dr Bhaskar Vira**, Reader in the Political Economy of Environment and Development, Department of Geography, University of Cambridge
- **Professor Martin White**, Programme Leader, Centre for Diet and Activity Research, MRC Epidemiology Unit, School of Clinical Medicine, University of Cambridge
- **Dr Iain Williams**, Deputy Chief Scientific Adviser, Department for Environment Food and Rural Affairs
- **Dr Doug Wilson**, Director of Scientific and Evidence Services, Environment Agency (England and Wales)
- **Nick Cosstick** (note-taker), Policy Intern, Centre for Science and Policy
- **Kaisa Juosila** (note-taker), Policy Fellowships Coordinator, Centre for Science and Policy