VULNERABILITIES IN THE FOOD CHAIN AND HOW WE CAN PROTECT THE INDUSTRY

Dr Seamus O’Reilly of Cork University Business School at University College Cork (UCC) outlines the major threats facing the food industry and identifies the steps to tackle them head-on.

In the aftermath of high profile issues around food contamination and authenticity, the industry as a whole is taking steps to address vulnerabilities that it currently faces and ones that may be a potential issue in the future. One of the experts in this area is Dr Seamus O’Reilly of Cork University Business School, UCC. Seamus has always had a particular interest in the food industry and, over a 25-year academic career, has worked closely with industry in the area of supply chain management. Since 2002 he has designed and delivered lean supply chain management programmes from Certificate to Postgraduate level for practitioners in multi-national and Irish owned companies spanning industries such as Food and Drink, Pharmaceuticals, Medtec, Electronics and Services. Currently Seamus is a Senior Lecturer in Cork University Business School, UCC, where he is Academic Director of Supply Chain Management programmes. He is also Academic Director of the part-time Diploma in Food Manufacturing Management offered by the Food Industry Training Unit in UCC.

Seamus and his colleagues have been looking at the issue of food fraud and defense, specifically from a supply chain management perspective. As he points out, while there has been quite a lot of focus on the development of analytical techniques to assess food authenticity, as well as the underlying conditions giving rise to food fraud and threat, other key areas have been somewhat overlooked. “There has been less attention on the management frameworks required,” Seamus explains, “For example, how does risk assessment, allocation of resources, and development and deployment of countermeasures fit with established enterprise risk management and supply chain governance mechanisms?”

Two of the key potential vulnerability issues currently facing the food industry globally are food fraud and terrorism and, while both arise from intentional acts, the motivations and executions...
What exactly do we mean by food security? It’s a widely recognised concept – in fact, the average world supply of calories was over 2,800kcal in distribution and access rather than an overall lack of calories plentiful supplies of cheap, uniform, largely safe food. And unchallenged since WWII has been hugely successful in producing capabilities of our planet. It is key that food bodies, and indeed countries, work together to combat threats. The EU Fraud Network facilitates the sharing of information among agencies and there is also OPSON, a joint INTERPOL-Europol organisation. Established in 2011, OPSON organises annual operations involving joint efforts of police, customs, national food regulatory bodies, and partners from the private sector. One OPSON investigation into fraudulent practice in seafood found illicit practices including species substitution and fraudulently selling tuna intended for canning as fresh. "The tuna intended for canning was illegally treated with chemical substances to give the misleading impression of its freshness," Seamus explains, adding. "A conservative estimate of the cost of this fraud to the European industry was put at €200m."

So what can the industry do to help combat this threat? Seamus believes that the level of collaboration should increase and that the industry as a whole needs to be looking for the next vulnerable area. In short, it’s like detective work; collecting crumbs of information currently available to work out where to focus on next. "We need to look more closely at the conditions that give rise to fraud to prioritise products to test, and priorities will shift over time as 'conditions' change. That’s why horizon scanning has a key role to play," Seamus says. "This includes data on weather conditions, price hikes, shifts in supply and demand, etc.” The threat to the industry is always changing and those within it need to be continually adapting. Collaboration, research advancements and constant horizon scanning may combine to form the best means to fight against food fraud and other vulnerabilities across the industry and beyond.

This article is based on a safefood-funded research project. The final research project is available at Publications/Research-reports.

ABOUT SEAMUS

Where did you grow up?
I grew up on a beef a farm in Co Meath.

What do you like to do in your spare time?
I love hill walking and I like to travel to explore different cultures, especially their cuisines.

Is there a book that inspired you?
There are lots, but I read Unlocking Leadership Mindtraps: How to thrive in complexity by Jennifer Garvey Berger, published by Standford Briefs, recently.
THE MARK OF SUCCESS

Offering reassurance to both the public and the food industry, The Q Mark is an indicator of hygiene and food safety standards, says Irene Collins, MD of Excellence Ireland Quality Association.

In a rapidly changing food industry and an ever-expanding global market, a benchmark of both safety and quality is not just helpful, it’s essential. The Excellence Ireland Quality Association (EIQA) has been at the forefront of this mission for fifty years and the association’s Q Mark logo is widely recognised as a representation of quality and excellence.

A trained chef, with over 30 years’ experience in the catering industry across supervisory, management, and senior executive roles, Irene Collins has seen the food industry from all sides. She took on the role of Managing Director of Excellence Ireland Quality Association in 2008 having been a customer of the association’s for 18 years. Her role involves sharing knowledge, best practice and ‘what works’ with customers on the different Q Mark programmes. “I love the daily interaction with companies who know that excellence is the unlimited ability to improve the quality of what they have to offer and knowing that the audits, assessments and certification services that we provide helps them to achieve their objectives,” she says.

As Irene explains, the Excellence Ireland Quality Association is the proud guardian of the Q Mark. Originally launched in 1978 Q Mark certification has become a byword for reliability and quality for the public. “When a consumer sees the Q Mark logo on a product or service they know that the business owner has quality standards and the customer at the heart of everything that the business does,” Irene explains.

The purpose of the Q Mark for Hygiene & Food Safety standard is to accelerate the growth of customer trust in food safety. “Our aim is to put quality and excellence at the heart of every company’s way of doing things,” Irene says, adding. “The Q Mark suite of standards promotes continuous improvement and the involvement of all employees in accomplishing a company’s goals.”

The EIQA’s variety of Q Mark programmes encompass areas such as Hygiene & Food Safety, Quality Management Systems, Leisure Centres, Nursing Homes, and ABLE – The Q Mark for Accessibility. The Q Mark is awarded to companies following an independent audit in compliance with what’s known as the Q Mark technical standard. “The audit is suitable for companies operating in food business including retail, distribution, catering, hotels and food manufacturing sectors,” Irene explains. “Every company audited has voluntarily opened up its premises, processes and procedures to a robust audit completed by a highly proficient and experienced food safety professional.” It is an intensive process, with auditors looking at things like the commitment of the management team to food safety; evidence that the food safety management system is working as intended; how companies plan and review their own performance, and the standard of the...
structure and services. "The auditor completes a comprehensive report, which clearly shows companies what they are doing really well (categories include recognising excellence, innovation, and creativity in food safety management systems), identifies any 'areas for improvement' and the auditor makes a recommendation," Irene reveals. "The recommendation is then presented to the certification committee at the end of each calendar quarter. Once this process is completed satisfactorily the Q Mark certificate is sent out to successful companies."

It is no small feat to receive the Q Mark and to acknowledge this success and level of commitment to quality and safety there is an annual Q Mark awards ceremony. "There is a universal desire for recognition. Not only do companies want to do well, they want to be seen to do well and the Q Mark Awards provides that opportunity and recognition," Irene says. "The awards are an opportunity for companies who are committed to high standards of food safety to tell both their customers and their peer group from a national stage that food safety management is at the heart of their business. It’s a healthy competitive process for the ‘best of the best’ representing food business operators across the industry."

This pursuit of excellence has the knock on effect of improving standards all across the industry. As Irene points out, "It is widely acknowledged that high standards of operational hygiene and a commitment to food safety accelerates consumers’ perceptions of food safety and grows customer trust. If a company is fully compliant with the requirements of the Q Mark for Hygiene and Food Safety programme they are operating above the requirements of Food Safety legislation and regulations."

This year sees the EIQA celebrate half a century of excellence and September’s Q Mark awards celebrate this significant milestone along with the hard work and dedication of the food industry across the island of Ireland. It is also a platform to highlight the importance of good practices across the whole food community. "Reporting Q Mark customers’ success at the Q Mark awards in local, regional and national media often sparks the much needed conversation about food safety," Irene says. "The reality is that food safety is too big a responsibility for any one person. We are all responsible. The food safety chain is a rather long one, and no matter what part of the food chain you are involved in, you have a responsibility for food safety."

For more information on the Excellence Ireland Quality Association go to: https://eiqa.ie/

**ABOUT IRENE**

**Where did you grow up?**

I grew up in the central belt of Scotland, deep in the coal mining traditions during the Maggie Thatcher years.

**I’ve been known to say...**

"If you can read...you can cook! And if you can cook, have a thermometer, and know the danger zone... you can cook safely!"

**What do you like to do in your spare time?**

I’m often involved in charity fundraising activities but what I’m really passionate about is wood turning.
THE IMPACT OF PLANT DISEASES

New approaches for protecting our favourite foods.

The potato blight (Phytophthora infestans) that caused the Great Irish Famine of the mid-nineteenth century, continues to be the primary disease affecting potatoes. In the UK, potato farmers spend £55m a year on average trying to keep blight at bay, while in the Republic of Ireland, it is estimated that £5 million is spent annually on fungicides to mitigate the impacts of the disease, and this corresponds to between 15 and 20 fungicide applications per season. According to the Sainsbury Laboratory, global crop losses from late blight are £3.5 billion annually. And that is just one particular pathogen.

An estimated 10-16% of global harvest (or US$220 billion worth) is lost to plant pests every year, according to the Food and Agriculture Organization of the United Nations (FAO). This includes huge losses in some of the world’s key commodities. A report by members of the International Society for Plant Pathology, published in *Nature Ecology & Evolution* in March this year, painted a picture of the potential devastation in five crops that together make up about half the global human calorie intake: wheat losses of 10-28%; rice losses of 25-41%; maize losses of 20-41%; potato losses of 8-21%; and soybean losses of 11-32%. In all, there were 137 pathogens and pests eating away at these crops. "We are losing a significant amount of food on a global scale to pests and diseases at a time when we must increase food production to feed a growing population," said Neil McRoberts, associate professor at the University of California and co-author of the paper.

Let’s not forget, these crops are not just food for the rich – they are the livelihoods for millions of people.

Take coffee. In 2012-13, coffee leaf rust (Hemileia vastatrix) spread quickly through the highlands of Central America, affecting more than 50% of the crop. Some Guatemalan producers lost up to 85% of their crop, with total losses in the region of US$500m and nearly 350,000 labourers put out of work, according to a report commissioned by Fairtrade Australia and New Zealand in 2016.

More recently, in Italy, 100,000 jobs have reportedly been lost in the olive oil supply chain as the country battles adverse weather and Xylella fastidiosa, which the European Commission has called “one of the most dangerous plant bacteria worldwide”. As National Geographic reported last year: “There is no known cure. Once the bacteria infiltrate a host, the plant stays infected until it dies.” As do the producers’ businesses.

The Italian farmers’ association, Coldiretti, warned the government in May that this could be an “irreversible trend if no action is taken”. As the trees withered on the farms, production of olive oil fell by around 50% (to 185,000 tonnes). Producers took to the streets wearing orange vests (gilet arancioni), having tired of national and regional policy “that did not seriously face the Xylella catastrophe” and the adverse weather, according to those interviewed by the Financial Times.

Indeed, start to look at the impact of plant diseases on our food commodities and there are myriad alarm bells ringing loud and clear. But is anyone listening? "As humans we are transfixed by diseases like malaria, HIV and TB, but we don’t think about diseases to crops,” explains Sarah Gurr, professor of molecular...
plant pathology and chair in food security at the University of Exeter. “It’s about time we did.” Professor Gurr has been banging this drum for a number of years (and has just received funding from the Canadian charitable organisation, CIFAR, to keep doing so). In 2012, for example, she co-authored a paper published in Nature that warned: “If severe epidemics in all five crops [rice, wheat, maize, potatoes and soybean] were to occur simultaneously, this would leave food sufficient for only 39% of the world’s population.” The probability of that happening is very low, the authors admitted. Nevertheless, even low-level persistent disease leads to losses that, if mitigated, would be sufficient to feed 8.5% of the seven billion humans alive in 2011.

“THOSE DISEASES ARE MOVING FAST AND WE NEED TO PROTECT OUR CROPS”

Since then, the warnings have become increasingly stark. “To avoid a global collapse in our ability to control fungal infections and to avoid critical failures in medicine and food security, we must improve our stewardship of extant chemicals, promote new antifungal discovery, and leverage emerging technologies for alternative solutions,” noted Matthew Fisher et al in their paper for Science in May 2018.

So, how did we get here? Intensive farming practices, cultivation of relatively few crops species and overuse of existing chemicals, certainly haven’t helped. Monocultures have in some cases “vastly increased” the susceptibility of harvests to pathogens. As Professor Gurr suggests, in some cases supply is totally reliant on a very narrow genetic resource; which is just daft”.

Take the banana. The "world's most important fruit", as the FAO calls it, is in the top 10 staple foods globally and represents 270g of every kilo of fruit bought in the UK (Kantar, 2017). However, only one variety of banana – Cavendish – is traded internationally (hundreds of varieties are grown for domestic consumption). This leaves the whole market perennially threatened by Panama Disease, its very own Sword of Damocles.

Panama Disease is caused by the soil-borne fungus Fusarium oxysporum f.sp. cubense. To date, four races of this pathogen have been described which attack different banana cultivars. Growers have already shifted once to cultivars resistant to race 1. But now they’re facing a new strain – race 4 – which attacks Cavendish clones (as well as other banana varieties) and has been moving westward since 2010. There are no alternative tradable varieties available and no existing chemical disease controls, so if this race reaches Latin America and the Caribbean, supply to the US and EU will collapse, with significant impacts on the Irish and UK diets and on producers in the developing world.

For the past three years, the £1.2m BananEx project (aka ‘Securing the future of the UK’s favourite fruit’) has been looking at building resilience in the supply chain, whilst scientists in the UK, Israel, Ecuador and Australia are all racing to deliver a genetically modified Cavendish banana that is resistant to Panama disease. “Even if you are able to tweak a Cavendish clone to be disease resistant there is nothing stopping the fungi from potentially evolving to beat it again,” Dr Dan Beuber, who leads the BananEx project at the University of Exeter, told The Guardian last year.

Given the threat to global food supplies (not to mention national economies) from plant disease, it is little surprise to see both gene editing and genetic modification bubbling up to the surface. Traditional breeding programmes work at a snail’s pace compared to superfast gene editing techniques in particular. At the same time, fungicide use is being restricted and those agrochemicals that are still in use are becoming increasingly redundant as resistant strains are evolving every three to four years. “Readers might not want to hear it, but GM is the best approach,” says Professor Gurr.

But it’s not the only approach, she adds: We also need to be far less reliant on high yield harvests derived from vast monocultures of monogenetically disease resistant crops, such as robusta and Arabica for coffee. We need more research into the potential of ancient varieties and let’s eat more seasonally because demand for things like strawberries at Christmas accelerates the emergence of diseases.”

Indeed, the globalisation of our food systems has brought us variety and choice, but carting food all over the world can result in plant diseases hitching a ride. An ability to survive independently outside of their host, as a free-living saprophyte or spores in the environment, has allowed fungi to pop up in unexpected places. More than half of all emerging diseases of plants are thought to be spread by introduction. The second most important factor is weather.

The changing climate appears to be turbo-charging the spread of fungi in particular. The banana once again provides a case in
These diseases are moving fast and we need to protect need for further resources is clear. As Professor Gurr says: “Despite significant impacts on food security, nutrition and currently underway. The workshops carried out in association with Teagasc provide practical advice and cover areas such as:

- Food Allergens In A Nutshell
- Food Labelling: What You Need To Know
- The Role of Packaging In Food Safety
- Food Hygiene Essentials: A Clean Regime
- Controlling Food-Poisoning Bacteria

Workshops are free but places are limited and allocated on a first come, first served basis. To register to attend, please visit: www.safefood.eu/events

17th September 2019  Sligo
18th September 2019  Ballinasloe

For more information please email: knevents@safefood.eu

FOOD SAFETY TRAINING WORKSHOPS FOR SMEs

safefood’s 2019 series of workshops ‘Food safety: Helping you to get it right’ for small and medium-sized food businesses are

HANDWASHING CAMPAIGN
RUFUS THE MESSY MONSTER

safefood has launched the latest phase of its Rufus handwashing programme which aims to help make learning good handwashing habits fun, and help to keep E.coli at bay. Programme materials includes a new Rufus storybook which uses fun illustrations and rhyme to teach children how and when to wash their hands, particularly after using the toilet; after playing (inside and outside), playing with pets and before eating. safefood is working in partnership with Early Childhood Ireland and Early Years NI to distribute over 4,400 Rufus handwashing packs to créches, playgroups and pre-schools across the island of Ireland. For more information, visit: safefood.eu/handwashing

ABOUT DAVID

David Burrows is a freelance writer specialising in sustainability within the food chain. A graduate in agricultural sciences, he researches and writes features and reports for publications including Just-Food.com, FoodNavigator.com, FoodserviceFootprint.com, Poultry Business, Pig World, The Grocer, and Transform.

point. Climate change has produced favourable temperatures for spore germination and growth of the fungus Pseudocercospora fijiensis, which causes Black Sigatoka disease and can reduce the fruit in infected banana plants by up to 80%, according to research by Dr Bebber published in Philosophical Transactions of the Royal Society B in May. There is also evidence that plant pathogenic fungi and oomycetes are moving polewards – at a speed of 8km a year, according to a 2013 study in Nature Climate Change. Coffee crops are under threat, for example, as leaf rust moves to the mountainous regions in Columbia where previously it was too cool for the fungus to survive.

Still, it’s early days in understanding the complex interactions between climate change and crop pests and pathogens. “Despite significant impacts on food security, nutrition and livelihoods, data on the scale, scope and trends of the problem are sparse and outdated,” says Cambria Finegold, global director for digital development at CABI, which in June received a US$200,000 grant from the Grand Challenges programme – an initiative of the Bill & Melinda Gates Foundation – to measure and estimate the global burden of crop pests and diseases. The data could be invaluable, helping to predict which regions might be susceptible to emerging diseases and diverting them to resistant or different crops. However, the need for further resources is clear. As Professor Gurr says: “These diseases are moving fast and we need to protect our crops.”
What exactly do we mean by food security? It’s a widely recognised concept – in fact, the average world supply of calories was over 2,800 kcal per person per day in 2014. This is more to do with inequality in access to food than with how much food is produced. Inequality is a problem for several reasons.

1. It is a determining factor in whether or not people acquire enough food to meet their nutritional needs. Where food is plentiful, people can buy what they want. Where food is scarce, they may starve or eat food that is not nutritious. Although an estimated 805 million people were still suffering from hunger chronically in 2014, this is more to do with inequality in access to food than with how much food is produced. These are both legitimate viewpoints; but there’s a third: that long-term food security can only be achieved if that same food can be produced within the country that consumes it.

2. The productionist model of food supply that has gone largely unchallenged since World War II has been hugely successful in producing plentiful supplies of cheap, uniform, largely safe food. And yet we have to ask ourselves whether this system can be sustained.

3. The convenient food that many of us now take for granted has come at a significant cost not only to our own health but to the health of the planet too. In 2009, a group of 28 internationally renowned public health experts signed a letter to the Lancet saying that the rise of obesity and non-communicable diseases such as heart disease and type 2 diabetes linked to poor nutrition are now the leading causes of death worldwide. This is terrible news. In this country alone, obesity and related conditions are linked to 17,500 preventable adult deaths and 140,000 deaths caused by smoking and alcohol each year. And yet some people think that food security is about ensuring reliable access to food for everyone.

4. These are all valid viewpoints. But the market has become increasingly driven by what people think they want rather than what we need to sustain ourselves. Consider, for example, how the global anxiety about obesity has led to the bountiful supply of cheap, convenient food that many of us now take for granted. The evidence is stacking up that the bountiful supply of cheap, convenient food that many of us now take for granted has contributed to the rise of obesity and related conditions as well as to the rise of non-communicable diseases such as heart disease and type 2 diabetes linked to poor nutrition.

5. One of the challenges for governments today is to find out how best to address these issues. They can do this by understanding how the food market works and by understanding how we can encourage and support the production of healthy food. But it is not enough to demand that we all eat healthily or to blame our own failure to eat healthily on the food market. Governments and businesses that think about food security in these terms are going to be very disappointed by the evidence that comes out of their work.

6. This is not to say that we cannot all do our bit. We can all help to create a food system that is sustainable and good for the future. We can all do our bit to help to create a food system that is sustainable and good for the future. We can all do our bit to help to create a food system that is sustainable and good for the future.