Údarás Sábháilteachta Bia na hÉireann
Food Safety Authority of Ireland

2025

The Food Safety Consultative Council Open Meeting

AI in Food Safety: Innovation, Risks, and Opportunities

Contents

Executive summary

The Food Safety Consultative Council (FSCC) of the Food Safety Authority of Ireland (FSAI) facilitates consultations and discussions to promote higher food safety standards. As part of fulfilling this role, the Council held an open meeting in February 2025 to explore the topic of artificial intelligence (AI) and gain insights into how AI is being applied to support food safety. The meeting was attended by over 150 people including consumers representatives, food producers, retailers, distributors, caterers, manufacturers, regulators, Government Departments, academia and technology companies. By creating a forum for dialogue between industry professionals, consumers and regulators, the FSCC meeting aimed to promote informed debate on the potential of AI to transform food safety practices. During the meeting, through presentations and discussions including real-world case studies from the food sector, technology providers and regulators, participants gained valuable insights into AI technologies such as machine learning, predictive modelling, and machine vision, how these innovations can safeguard food safety across the food supply chain but also the challenges associated with use of AI.

AI is increasingly embedded in the agri-food sector, supporting traceability, predictive models, and quality control systems. Ireland's National AI Strategy aims to position the country as a global leader in ethical AI adoption. In order to achieve this, regulators and industry alike must ensure transparency, accountability, and ethical use when integrating AI into food safety processes.

Key learnings and takeaways from the meeting include:

- **Openness to AI**: Participants acknowledged AI's potential for business and food safety while recognising associated challenges and possible risks.
- **Drivers for AI adoption**: One of the current drivers for AI adoption that was seen in the case studies was improvements in operational efficiency in relation to food safety compliance, but AI also offers the opportunity to improve identification of risk and targeting of food safety interventions contributing to safer food for consumers.
- **Managing AI risks**: Concerns include bias in AI models and AI hallucinations – this is where systems generate false or misleading information. Strong human oversight and guidelines are essential.
- **Regulatory considerations**: The Irish government mandates that public sector AI tools align with European Union (EU) principles for trustworthy AI.
- **Balancing innovation and responsibility**: AI should complement existing food safety mechanisms rather than replace them. Human oversight remains critical.

- **Data quality matters**: Robust, high-quality data underpins effective AI models and ensures reliable outcomes.
- **Future outlook**: AI solutions continue to evolve in the food sector, a balanced approach that supports innovation while mitigating risks to consumers must be maintained.

In conclusion, the FSCC event clearly demonstrated that advancing AI in food safety is as much about responsible innovation as it is about technological progress. The discussions, case studies, and expert insights highlighted not only the transformative potential of AI, from boosting traceability and operational efficiency to enhancing predictive capabilities, but also the need for rigorous data integrity, ethical standards, and vigilant oversight. As Ireland continues toward adoption of AI in line with the Government vision this approach of using AI to serve people, ensuring public trust, a collaborative approach and shared commitment of all stakeholders to ethical and trustworthy AI will be essential to ensuring that AI-driven food safety solutions reinforce, rather than replace, the established practices that protect our food.

1. Introduction

The Food Safety Consultative Council (FSCC) of the Food Safety Authority of Ireland (FSAI) hosts an Open Meeting each year to facilitate consultation and discussion on food safety issues. The 2025 event focused on the transformative potential of artificial intelligence (AI) in food safety. Held on 25 February 2025 in Dublin, this in-person event brought together key stakeholders, thought leaders, and industry professionals from across the food and technology sectors.

With AI increasingly influencing various industries, this event provided a forum for exploring its application within the agri-food sector, specifically in enhancing food safety systems.

Event speakers: (L-R) Dr Marc Wagner (Kerry), Dr Geraldine Duffy (Teagasc), Dr Brendan Byrne (TOMRA), Dr Pamela Byrne (FSAI), William O'Sullivan (Creme Global), Mr Dave Lang (FSCC/Associated Craft Butchers of Ireland), Dr Brian Mac Namee (UCD), Suzanne Campbell (Event Chair), Ms Gail Carroll (FSAI), and Dr Cormac McElhinney (FSAI). Not pictured here is Dr Elske van der Vaart (NVWA).

The event aimed to provide a platform for FSAI stakeholders to examine both the opportunities and challenges that AI presents to the food system. Through presentations, real-world case studies, and expert panel discussions, participants gained valuable insights into AI technologies such as machine learning, predictive modelling, and machine vision, and how these innovations can safeguard food safety across the food supply chain.

By creating a forum for dialogue between industry professionals, technology experts, and regulators, the FSCC aimed to promote informed debate on the potential of AI to transform food safety practices.

This report gives an overview of the event, including the insights shared by speakers, the perspectives offered by attendees, and the ongoing importance of collaboration across all sectors to advance the safe and responsible adoption of AI in food safety practices.

Role of the FSCC

The FSCC is a statutory Council established under the Food Safety Authority of Ireland Act, 1998. Its purpose is to facilitate consultations and discussions with a wide range of stakeholders, for the purpose of promoting higher standards or for any other matters relating to the functions of the FSAI. The Council has up to 24 members representing consumers, the food industry, food inspectorate and academia. The chair is a member of the Council. Full details of the FSCC membership, and meeting minutes are available on www.fsai.ie and listed in the Appendix.

The FSCC meets regularly, and through the course of its meetings, examines segments of the food chain, from farm to fork, to review the food safety initiatives already in place and those required to ensure consumers' interests are to the forefront. The FSCC holds an annual open meeting on a theme selected by the Council members. Recent open meeting themes have included food safety and sustainability, on-line food delivery, and food safety culture.

Motivation and objectives of the AI in food safety event

With AI rapidly becoming embedded in businesses across all sectors, as the first AI and food safety event in Ireland, this event was designed for food businesses, food safety professionals, regulators, policymakers, and anyone curious about the future of food safety and how emerging technologies are influencing the industry.

The FSCC event objectives were to:

- Provide a platform where the FSAI and its stakeholders could learn about the various ways in which AI is already being applied in the food system, as well as explore practical potential future applications.
- Educate stakeholders and interested parties on how AI tools could potentially contribute to more efficient, effective, and proactive food safety management practices, enhancing public health outcomes.

- Have an open and transparent sharing of information and discussion on the tools and technologies which are quickly playing an integral supporting role in ensuring the safety and integrity of the food supply chain.
- Facilitate an understanding and debate on the challenges and opportunities associated with use of AI to support food safety.

2. Event details

The open event hosted 150 attendees from 67 different organisations representing a broad range of sectors including various sectors of the food industry, consumers, regulators, technology companies and academics. Attendance was open and free of charge. There was a very high level of interest in attending this event from all stakeholders, indicative of the relevance of this topic.

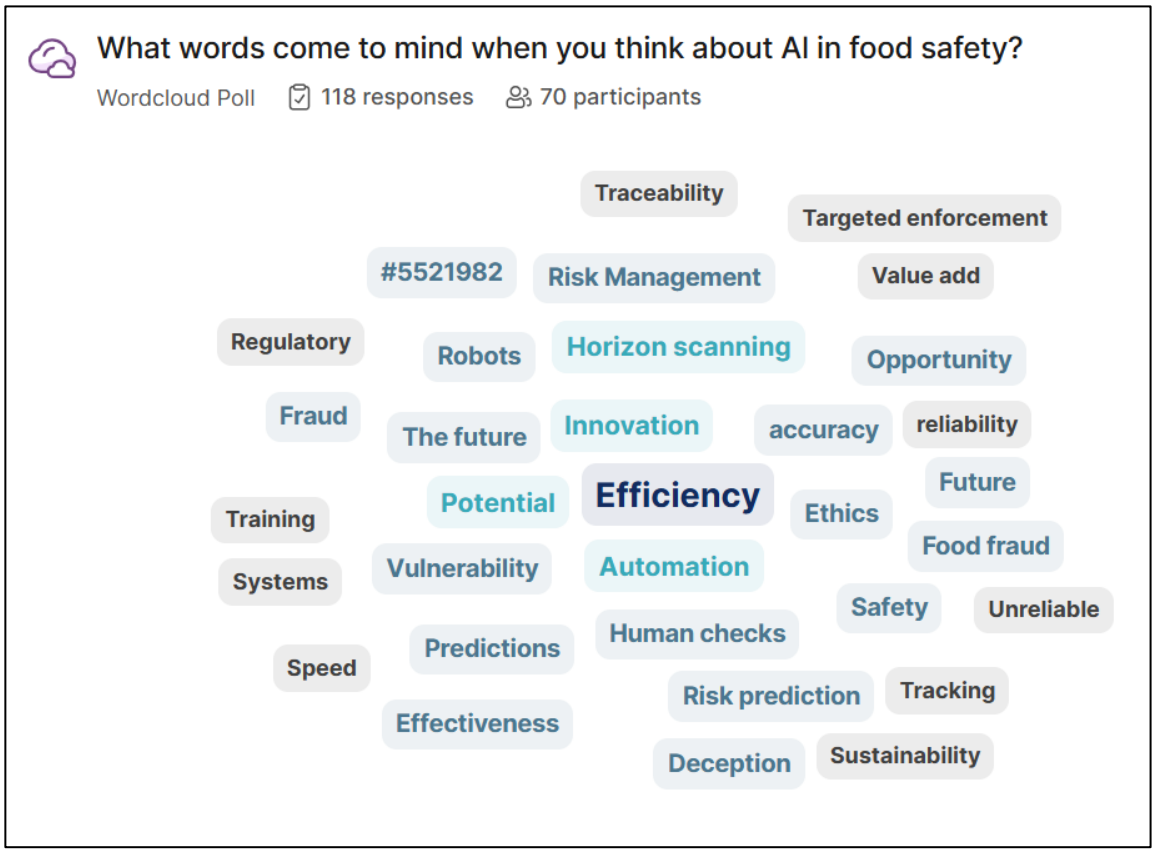
The event was chaired by Suzanne Campbell, food and farming author and journalist. Speakers were from across a range of sectors, including from food safety regulators, the food industry, technology businesses, food development bodies and academia. These experts were invited to speak due to their real-life knowledge and experience in applying AI tools and technologies, and the valuable insights they could offer into the practical applications of AI in the food industry.

Agenda

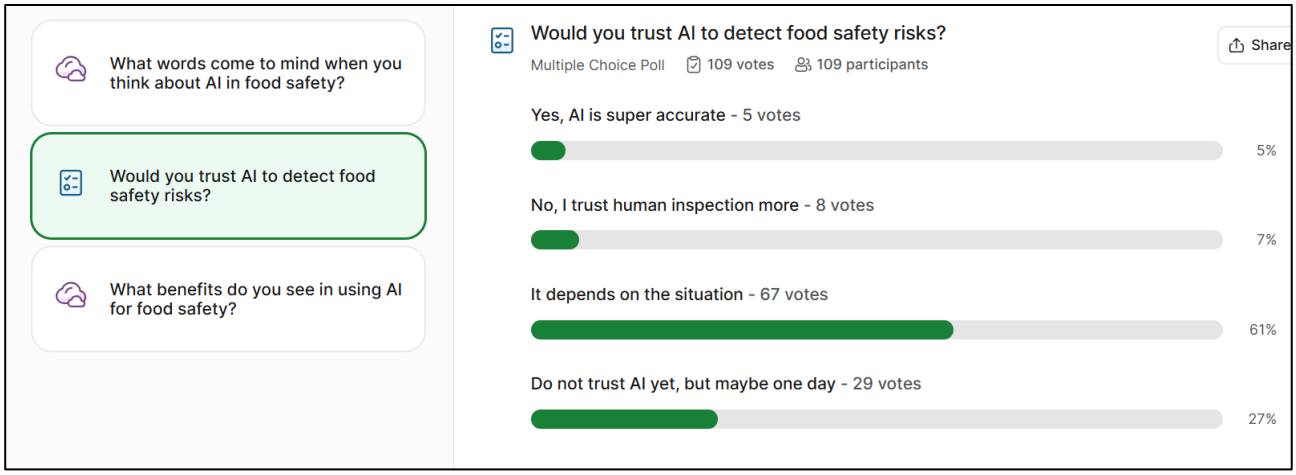
Session Title	Speakers & Roles
Event Chair	**Suzanne Campbell** Journalist, Author & Broadcaster
Opening Address	**Dr Pamela Byrne** Chief Executive, Food Safety Authority of Ireland **Mr Dave Lang** Deputy Chair, Food Safety Consultative Council / Head of Development, Associated Craft Butchers of Ireland
AI Behind the Curtain: What Can and Can't Be Done and Why We Should Care	**Dr Brian Mac Namee** Associate Professor, School of Computer Science, University College Dublin / Director, Insight SFI Research Centre for Data Analytics / Chair, Artificial Intelligence Association of Ireland
Leveraging AI for Food Protection Predictive Modelling	**Dr Marc Wagner** Data Analytics and AI Lead, Kerry
AI Computer Vision Systems for Monitoring and Inspection in Food Production	**Dr Geraldine Duffy** Research Officer, Teagasc
AI in Food Production: Sorting and Grading	**Dr Brendan Byrne** Technology Manager, Artificial Intelligence, TOMRA
Networking & Refreshment Break	
On Strong Foundations: From Data to Delivery	**William O'Sullivan** Head of Data Science, Creme Global
Using Machine Learning to Target Oversight Effectively	**Dr Elske van der Vaart** Data Scientist, NVWA (Netherlands Food and Consumer Product Safety Authority)
Panel Discussion & Audience Q&A	**Chair:** Suzanne Campbell **Panelists:** Dr Brian Mac Namee, Dr Marc Wagner, Dr Geraldine Duffy, Dr Brendan Byrne, William O'Sullivan, Dr Elske van der Vaart, Dr Cormac McElhinney
Closing Address	**Gail Carroll** Director, Regulatory Affairs and Compliance Building, Food Safety Authority of Ireland

Audience engagement

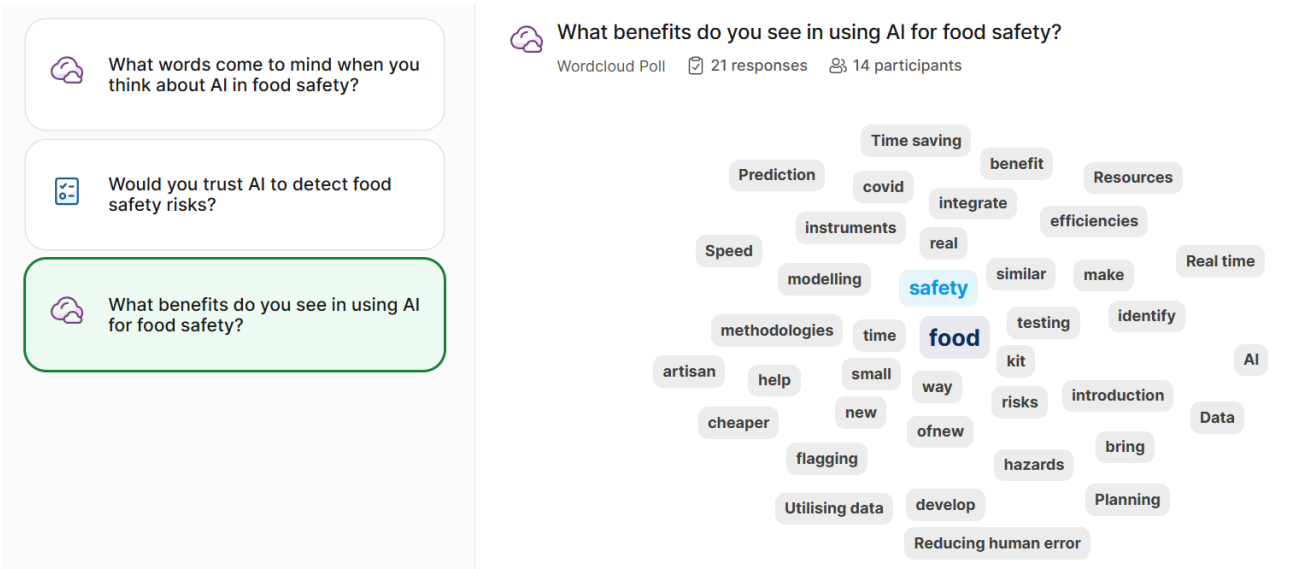
There was a high level of engagement from event attendees during the meeting. When presented with opportunities to provide their thoughts, opinions and viewpoints, the attendees actively engaged with interactive elements, such as polls and word clouds, which enriched the event by providing real-time insights and audience participation. Some examples are set out below:



Word cloud "What words come to mind when you think about AI in food safety?"



Poll "Would you trust AI to detect food safety risks?"



Word cloud "What benefits do you see in using AI for food Safety?"

Opening address

Dr Pamela Byrne (Chief Executive Officer of the FSAI at the time of the event) and Mr Dave Lang (Deputy Chair of the FSCC and Head of Development at the Associated Craft Butchers of Ireland) gave the opening address.

Dr Pamela Byrne opened the event, welcoming stakeholders and emphasising the collaborative nature of the event and the critical role each stakeholder plays in safeguarding Ireland's food systems.

Dr Byrne outlined the impact AI is already having on food safety, noting its applications in areas such as traceability, predictive modelling for disease outbreaks, and machine vision systems for quality control. AI is presented not only as a tool for enhancing operational efficiency but also as a mechanism for ensuring the safety and integrity of the food supply chain. However, it was also noted that with great innovation comes significant responsibility. The risks associated with these technological advancements must be carefully managed to maintain public trust and uphold food safety standards.

Dr Byrne stressed the importance of a balanced approach to AI adoption. While recognising the vast potential that AI holds for improving food safety, Dr Byrne reminded attendees of the need for a vigilant regulatory framework which ensures transparency, accountability, and sustainability in food safety practices. This framework must align with emerging technological developments while remaining responsive to the evolving risks and challenges that accompany AI implementation.

She highlighted the FSAI's commitment to fostering a regulatory environment that supports innovation whilst adhering to best practices, such as the Government's National AI Strategy. The FSAI's role is to strike a balance between encouraging innovation in food safety but also ensuring

that any associated risks are effectively mitigated, and the highest standards of food safety are maintained.

Dr Byrne concluded by acknowledging the invaluable contributions of the FSCC members, speakers, and all attendees. Their collective expertise and active participation would be key to navigating the future of food safety in the age of AI.

Following the opening address by Dr Pamela Byrne, Dave Lang acknowledged the FSCC's commitment to supporting the work of the FSAI, meeting four times a year for frank exchanges of views on critical food safety issues. He also highlighted the importance of the annual open meeting as a key platform for broader discussions and dialogue among stakeholders.

AI Behind the Curtain: What Can and Can't Be Done and Why We Should Care

Dr Brian Mac Namee (Associate Professor, School of Computer Science, University College Dublin) gave the keynote address at the FSCC event.

Dr Brian Mac Namee's keynote address provided an overview of AI, shedding light on both its immense potential and the challenges it presents. He explained the various techniques that power these systems and what AI is truly capable of, while also addressing its limitations. Dr Mac Namee highlighted "the good, the bad, and the ugly" aspects of AI's development, emphasising that while AI-based tools have become increasingly accessible and usable, their deployment remains highly challenging.

Dr Mac Namee discussed how the rising interest in AI has led to inflated expectations, with many considering it a “magical” solution that can solve almost any problem. He stressed that while AI systems can be powerful, they are not a universal remedy and require careful consideration of their capabilities and limitations. He broke down key AI functionalities, including classification, prediction, recommendation, generation, and interaction, providing examples such as predictive disease modelling, personalised recommendations (like Netflix and Amazon), and the emergence of generative AI systems such as ChatGPT, which create new content based on existing data.

The keynote also touched on the evolving role of language models, particularly large language models, which are transforming how AI systems interact with users. From simple text completion to complex, back-and-forth conversations, AI's ability to engage in dynamic interactions has opened new avenues for industries to integrate AI into their operations. Dr Mac Namee emphasised that businesses across sectors have significant opportunities to harness these capabilities for innovation and efficiency.

However, Dr Mac Namee was quick to highlight the challenges posed by AI, particularly the unreliability of generative AI systems, which can sometimes produce erroneous or "hallucinated" results. He also raised important regulatory and ethical considerations, pointing to the recent implementation of EU regulations governing AI and stressing the need for organisations to be mindful of these frameworks as they adopt new technologies. The question of how AI impacts industries - particularly creative industries that are being disrupted by AI tools - was also addressed, with Dr Mac Namee urging businesses to carefully manage their reputations when incorporating AI.

To respond to these challenges, Dr Mac Namee recommended that organisations take proactive steps including experimenting with AI tools, developing an AI strategy, and considering regulatory requirements. He emphasised the importance of embracing the potential of AI with a strategic approach. For larger organisations, training and educating the workforce on AI's potential and risks is essential. Dr Mac Namee concluded with a reminder that AI's trajectory is not without setbacks, referencing the phenomenon of "AI winters" which are periods of reduced investment in the research and development of AI tools and the decline of customer interest in using these tools and technologies.

Dr Mac Namee’s keynote was a call to action for all stakeholders in the food safety and agri-food industries, urging them to embrace AI thoughtfully, prepare for its challenges, and seize the opportunities it presents to strengthen food safety systems.

Leveraging AI for Food Protection Predictive Modelling

As part of Kerry's Digital Transformation, the Kerry team has identified an AI solution that supports food safety. Dr Marc Wagner's presentation on leveraging AI for food protection predictive modelling provided an in-depth exploration of how AI can transform the way we approach food safety, particularly in the context of *Listeria monocytogenes*, a major pathogen of concern in the food industry. His presentation highlighted the critical importance of *Listeria* control, detailing the significant public health impact, including hospitalisations and deaths reported by the US Centres for Disease Control and Prevention (CDC). In particular, Dr Wagner pointed to the closure of meat processing plants and the potential for criminal charges in the wake of *Listeria* outbreaks as a strong reminder of the high stakes involved in food safety.

Dr Marc Wagner (Data Analytics and AI Lead, Kerry) presented on leveraging AI for food protection predictive modelling.

Kerry's approach to addressing these challenges has been both innovative and pragmatic. Faced with the limitations of existing predictive models, which lacked the necessary customisation for specific food products and formulations, Kerry decided to develop its own tailored AI model. Dr Wagner emphasised the company's commitment to helping the food industry build more accurate and adaptable predictive models for *Listeria* control. Recognising the inefficiencies and gaps in current solutions, Kerry's internal data science team, in collaboration with experts in the fields of AI and food protection, set out to design a model that could address these shortcomings.

Central to the success of Kerry's predictive model is its ability to streamline the food safety testing process. Dr Wagner explained that traditional approaches often require extensive testing, micro studies in laboratories, and sensory validation - all of which are time-consuming and resource-intensive. However, predictive models, particularly those powered by AI, offer a compelling alternative. By automating much of this process, Kerry's model can predict optimal preservative dosages and growth patterns, cutting development time by as much as 5 to 10 months. This acceleration in product development is a game changer for the food industry, allowing companies to bring safer products to market more quickly.

At the centre of Kerry's innovation is the AI-powered tool that is designed to assist scientists in processing and analysing experimental data. Dr Wagner outlined how the tool detects growth

curves, classifies them into growth or no-growth categories, and fits the data to industry-standard equations. With an accuracy rate of over 95%, this tool significantly reduces manual analysis time, automating much of the work traditionally done in spreadsheets and manual processes. This streamlined approach not only improves speed but also enhances precision, enabling scientists to fine-tune critical variables such as temperature, pH, and preservative concentrations with greater accuracy.

Furthermore, Kerry's predictive model is built to support ongoing validation by scientists. Dr Wagner highlighted that while AI provides invaluable assistance in data analysis, human expertise remains a crucial component in ensuring regulatory compliance. Scientists using the AI tool are empowered to validate and adjust the AI-generated results, ensuring that the model remains in alignment with food safety regulations and standards.

A feature of Kerry's approach is the continuous feedback loop embedded in the AI tool. Every action taken by scientists within the platform - including inputting data, validating results, or making adjustments - is captured and used to generate additional training data. This data feeds back into the AI system, allowing the model to learn and improve over time, making it more effective with each use. Dr Wagner noted that this dynamic learning process enables the model to evolve in response to new insights and research, ensuring its long-term utility and improved accuracy.

Kerry's AI-driven approach to predictive modelling offers several key benefits. These include a significant reduction in the time spent on research and development, leading to faster product development, as well as cost savings through reduced labour and resource requirements. Additionally, the increased precision provided by AI allows for more targeted interventions, ultimately leading to safer food products and fewer instances of contamination.

Dr Wagner concluded his presentation with a vision for the future of AI in food safety. He emphasised that Kerry is committed to advancing this technology to further scale predictive modelling and enhance food safety. By integrating AI into food protection systems, Kerry aims not only to make food safer but also to reduce food waste and improve overall product quality.

AI Computer Vision Systems for Monitoring and Inspection in Food Production

Dr Geraldine Duffy introduced the growing role of AI and computer vision systems in food production, emphasising their potential for automating the traditionally manual inspection processes in areas such as quality assessment, grading, contamination detection, and animal welfare monitoring. The need for automation in food inspection is driven by challenges such as high line speeds, potential for operator error, and labour shortages.

Dr Geraldine Duffy (Research Officer, Teagasc) presented on computer vision systems for monitoring and inspection in

The core of computer vision in this context is the use of artificial intelligence, specifically convolutional neural networks, to analyse images and recognise patterns in food items. These systems rely on deep learning algorithms, which are trained on vast datasets of images to identify defects, contamination, and other relevant features. The systems can be deployed at various stages of the production process, such as for post-harvest grading, in slaughterhouses for animal welfare checks, or on food processing lines.

In the horticulture sector, AI computer vision systems have potential use in classifying diseases, pests, and other issues with crops through image recognition. This can result in improvements in productivity and a reduction in food waste. It was proposed that systems can also support food safety by detecting potential contamination risks like mycotoxins.

Dr Duffy shared examples of potential AI applications in the mushroom industry, where robotic grippers aligned with computer vision to harvest mushrooms have been developed, addressing the challenge of labour shortages in this sector. Another example of applying computer vision in horticulture involves using drones equipped with cameras to monitor crops for diseases and pests, offering real-time data.

In the meat industry, AI systems have the potential to support the meat inspection of animals post-slaughter. Dr Duffy highlighted a computer vision system called VetInspector, developed in Denmark and approved for use by the EU in poultry plants, where a vision system helps inspectors in high-speed poultry plants to detect contamination and animal welfare issues, reducing manual labour and improving accuracy.

Similarly, there is ongoing research and development on computer vision systems to support meat inspection of pigs at slaughter, with systems under development to detect pig lung lesions and other animal welfare concerns, such as tail lesions.

Despite the benefits, Dr Duffy acknowledged the various challenges of deploying AI in food production settings, particularly around the need for large datasets to train algorithms, regulatory approvals, and technical issues like camera quality, lighting, and data privacy. However, as research advances, these systems are expected to become more precise and integrated with other sensors, improving the safety, efficiency, and sustainability of food production processes.

The talk concluded with Dr Duffy touching on future developments in AI, particularly in predicting foodborne pathogens and enhancing food safety, as part of a broader research project focused on sustainable food systems.

AI in Food Production: Sorting and Grading

The presentation by Dr Brendan Byrne on TOMRA Food's technologies in the food sorting and grading sector provided an exploration of how the company is approaching food safety and resource management for food growers and packers globally. TOMRA, a Norwegian company, develops systems for enabling the circular economy, specialising in resource collection, recovery and sorting for recycling and mining applications, and sensor-based food sorting and grading.

Dr Brendan Byrne (Technology Manager, AI, TOMRA) presented on the use of AI in food sorting and grading.

Central to this transformation are the inspection and grading systems deployed across various industries, particularly in the food sector. TOMRA's technology focuses on maximising food safety while minimising food loss, addressing the fact that 14% of food is still lost between harvest and the retail shelf. TOMRA Food's role in this process is to ensure that food is efficiently sorted and graded, identifying and removing foreign materials and contaminants.

TOMRA Food's sorting systems rely on advanced imaging technologies, including multispectral, X-ray, and spectroscopy systems, to inspect food products in real-time. The technology captures multiple wavelengths of light, allowing for detailed analysis of food items as they move along the

production line. For example, in a typical application for whole potatoes, the system analyses potatoes as they fall through the air, using high-resolution imaging to detect blemishes, contaminants, and other imperfections. The technology detects both visible defects such as spots, cracks, and size irregularities, and invisible hazards like toxins and foreign materials, such as wood, plastic or animal bones. Once identified, the system makes a 'sorting' decision and directs each potato to its appropriate destination.

Dr Byrne highlighted the complexity of managing both the accuracy and speed of these systems. With 50 milliseconds to make sorting decisions, the technology must process vast amounts of data from imaging systems to activate the sorting mechanisms. The introduction of deep learning models has significantly improved detection efficiency and robustness, allowing for more accurate sorting and grading in food production plants. This shift from traditional machine learning to deep learning models has been a key innovation, enabling TOMRA Foods to enhance system performance while also providing ease-of-use to operators and allowing consistency between operators, batches, and shifts.

Real-world applications of TOMRA's technology were also discussed, showcasing its ability to improve food safety and yield efficiency. For instance, the implementation of AI-driven sorting systems in food processing plants has helped food businesses to reduce food waste and increase product quality. Examples included improved sorting of apples with stem bowl defects, which were previously difficult to accurately classify using traditional methods. These innovations have led to significant improvements in food sorting efficiency.

The presentation also addressed the operational challenges solved by implementing AI-based systems in food processing. These include ensuring high detection accuracy, minimising downtime and reducing the risk of product recalls. For instance, downtime in a French fry plant can be costly, making it crucial to maintain continuous, reliable performance of sorting systems. The use of deep learning models has also helped improve the adaptability of these systems to handle different food products and production environments.

In conclusion, TOMRA Food's approach to food sorting and grading demonstrates the current progress of AI and the significant potential deep learning technologies have to drive efficiency, safety, and sustainability in the food industry. By implementing advanced imaging technologies and deep learning models, food businesses are seeing improved operations, reduced waste, and strengthened safety and quality of their products. With innovations in AI emerging rapidly, the future of food sorting looks increasingly automated, and data driven as outlined by Dr Byrne.

On Strong Foundations: From Data to Delivery

The session emphasised the pivotal role of data in improving food safety and optimising processes within the food industry. Mr William O'Sullivan discussed the complexities of predicting risks and the importance of building comprehensive, high-quality datasets to enable effective risk management and decision-making.

Mr William O'Sullivan (Head of Data Science, Crème Global) speaking about the role of data in improving food safety within the food industry.

A significant point raised was the challenge of identifying food safety risks before they emerge. While AI and machine learning models can help analyse trends, predicting issues like microbial or chemical hazards with complete accuracy is difficult, particularly when dealing with unknown or rare events (Black Swan events). Therefore, the focus should be on capturing and understanding known risks, such as microbial hazards, and modelling them based on real-world data.

The importance of incorporating human expertise alongside and within AI systems was highlighted, noting that while AI can help analyse vast amounts of data, it is crucial to ensure the quality and representativeness of that data for accurate risk prediction. Models that rely on incomplete or biased data often lead to inaccurate conclusions, which can ultimately negatively affect decision-making.

A major theme of the discussion was the need for collaboration and data sharing across industries, regulators, and consumers. It was suggested that open-source and publicly available data can help bridge gaps in knowledge, allowing for more robust models and better decision-making. Although data sharing is often hindered by concerns over privacy and competition, there is a growing recognition of the value in pooling resources to create more robust datasets. Open-source intelligence and publicly available data were seen as essential tools to help create more representative models that can lead to better outcomes for food safety.

The application of AI and machine learning was also explored in the context of product optimisation. For example, the development of a model to predict sensory attributes of sausages - based on various ingredients and processing parameters - was presented. By analysing different proportions of meats, additives, and salts, the system can optimise products for sensory qualities like taste and texture, as well as food safety factors like microbial hazards.

The session concluded by discussing how AI can be used not only to improve individual products but also to optimise entire production processes. By using data-driven models, businesses can fine-tune their operations in various ways, including to enhance food safety, reduce costs, and create products that meet both consumer demands and regulatory standards.

In summary, the session underscored the need for utilising data effectively, improving data collection methods and optimising data processes; these actions would support the food industry to make significant strides toward enhancing food safety and product quality while experiencing other business benefits like reducing costs. Additionally, by making informed decisions based on high-quality data and predictive models, the food industry can stay ahead of emerging risks and continue to innovate in a safe and sustainable way.

Using Machine Learning to Target Oversight Effectively

The presentation on the use of machine learning for targeting inspections in regulatory oversight offered a detailed examination of how AI can be leveraged to enhance the effectiveness of inspections. Dr van der Vaart began by outlining the fundamentals of machine learning, particularly in the context of regulatory bodies, and emphasised how these tools are still relatively novel in regulatory environments. While machine learning techniques may seem commonplace in broader AI discussions, their application to regulation is a relatively recent development, offering both significant potential and unique challenges.

Dr Elske van der Vaart (Data Scientist, Nederlandse Voedsel-en-Warenautoriteit (The Netherlands Food and Consumer Product Safety Authority) presenting on the use of machine learning to target oversight effectively.

Dr van der Vaart explained the process of using machine learning to predict compliance risks, starting with the assembly of large datasets containing attributes of the companies being inspected and results from previous inspections. This data is then split into training and test sets, with machine learning models trained to identify patterns that might indicate non-compliance. The goal of this process is to prioritise inspections based on the predicted risk of non-compliance, allowing regulators to focus their resources in areas that are most likely to breach regulations.

One key example discussed was The Netherlands Food and Consumer Product Safety Authority's (NVWA) application of machine learning to animal welfare inspections. The NVWA used a machine learning model to predict which farms were at the highest risk of violating animal welfare laws. By

combining data from two primary sources - the annual Agricultural Survey and the Real-Time Identification Registration System - the Authority created a dataset containing 48 potential predictors of non-compliance. These predictors included farm characteristics, such as the types of animals raised, and the number of pigs delivered to slaughterhouses. The model's goal was to identify farms where there was a higher likelihood of serious violations, thus helping prioritise inspections.

Dr van der Vaart also detailed the process of model development, specifically the choice of a Random Forest model, which combines multiple decision trees to make predictions. This technique, while powerful, raised important questions about transparency. As the speaker noted, revealing which attributes the model uses to make predictions could potentially lead to businesses altering their behaviour strategically to avoid detection, a concern that continues to be debated within the NVWA.

After training, the model, when applied to unseen data, seemed able to select non-compliant farms about two and a half times more often than would be expected by chance. On the training data, the rate was about five times higher, suggesting that the model was overfit. However, when the model was tested in practice, and used to select 50 new farms, 40% were found to be violating, which was considerably higher than the 8% observed in farms inspected at random in the previous years. Thus, the speaker emphasised that despite overfitting, the model still performed better than random inspections, and its ability to prioritise higher-risk farms showed significant promise for future use in both animal welfare and food safety.

The presentation also addressed the broader implications of machine learning in regulatory frameworks, particularly in the food safety sector. By using similar data, such as inspection results, business characteristics, and historical compliance records, machine learning models could help regulators target high-risk food businesses more effectively. Dr van der Vaart highlighted that, with sufficient data, the same machine learning principles applied to animal welfare could be transferred directly to food safety, making inspections more data-driven and efficient.

In conclusion, Dr van der Vaart emphasised that while challenges remain, particularly around model transparency and overfitting, the use of machine learning in regulatory oversight represents a significant step forward. Machine learning can help regulators better target their efforts and maximise the impact of their inspections. The potential for similar applications in food safety is vast, and as the technology continues to evolve, it is likely that regulatory bodies will increasingly be able to integrate tools and technologies built on artificial intelligence to enhance and support their regulatory operations. This approach offers not only the promise of more efficient inspections but also a more proactive approach to compliance, ultimately contributing to the strengthening of regulatory systems across industries.

Panel discussion and audience Q&A

Panel discussion and audience Q&A

Each speaker, in addition to Dr Cormac McElhinney, Acting Manager Data Centric Project, FSAI, participated in a panel discussion to address audience questions about implementing and leveraging AI in the food system. The panel was moderated by the event Chair, Suzanne Campbell.

Through the Q&A session, panellists discussed real-world challenges such as the integration of AI into existing production lines, the scalability of AI solutions, and the ways in which companies can overcome the data and resource-intensive nature of training algorithms.

In addition to the practical challenges, there was also a significant discussion on the ethics of AI. The panellists explored concerns around data privacy, security, and the need for transparency and fairness in AI decision-making processes. They emphasised the importance of designing systems that are unbiased and that can be trusted by both operators and consumers.

The panel debated concerns around the sustainability of using and building AI tools and technologies, acknowledging how resource-intensive these tools can be to build and operate. Some AI tools require intensive computational power which results in high energy use, particularly during the training phase where the tools are being trained on large datasets to learn to recognise the relevant patterns. The panel noted that while these concerns are legitimate, the goal for building and using these tools is to create savings and efficiencies in the sector overall. A balanced approach must be found in order to reduce the negative environmental impacts of these tools while maximising the benefits they offer.

Furthermore, the panel addressed the EU AI Act, which is a legislative framework developed in the EU to regulate AI technologies. The discussion focused on how the Act could impact the

deployment of AI in food production and other sectors, with an emphasis on ensuring that AI is used responsibly, with appropriate oversight, to minimise risks and protect users and consumers.

The conversation around ethics and regulation highlighted the need for ongoing dialogue to ensure that AI technologies evolve in a way that is not only innovative but also responsible, unbiased and ethical. This included the importance of ensuring AI systems remain transparent, accountable, and aligned with societal and business values. The importance of having human oversight in the application of AI-generated or AI supported works was stressed.

The panel noted that for areas like regulation, it is necessary for any AI tools that would support this work to be designed to allow for the decision-making that occurs within the “black box” to be appropriately examined. AI tools should be developed with transparency and accountability at their core. This means designing systems that clearly document their decision-making processes, ensuring that outputs can be traced back to the underlying logic or data. Stakeholders must be able to assess the compliance, fairness, and ethics of the outputs; this will support the building of trust in consumers, and safeguard against unintended consequences.

Participants asked questions around trusting the answers provided by AI tools like chatbots, and how consumers and other actors within the food safety system could trust AI-generated responses to questions. Additionally, from a business perspective, implementing AI chatbots could add value and so there is a desire from industry to understand the best practices behind designing and implementing chatbots. The panel discussed optimally designing chatbots to provide information from only reliable and trusted sources. Ultimately the quality of any AI tool depends on the quality of the underlying data; the panel emphasised the need for better and more extensive data collection and using higher quality data in all aspects of business operations, including in AI business tools. Whether it is analytics or more advanced techniques like predictive modelling or building chatbots, the quality of the output is directly related to the quality of the input.

Overall, the panel discussion, combined with the attendee questions, provided a well-rounded view of the current and future impact of AI in the food system. The hour-long panel discussion ended by addressing both the opportunities and the real risks that still need to be mitigated, including the crucial ethical and regulatory considerations.

Closing address

Ms Gail Carroll, Director of Regulatory Affairs and Compliance Building, closed the meeting. Taking insights from the various speakers and the panel discussion, the event was closed on a positive note, with those in attendance having learned the potential of AI to transform food safety practices while gaining practical knowledge into the real challenges that must be overcome for AI to be effectively integrated into the food safety system.

3. Discussion and conclusion

From ensuring traceability in the food supply chain to creating predictive models for disease outbreaks and implementing machine vision systems for quality control, AI is already becoming embedded in the day-to-day operations of the agri-food sector. The FSCC event was an important multi-stakeholder opportunity to highlight and discuss the challenges and opportunities associated with AI and food safety.

The Government has set out in *Ireland's National AI Strategy*[1], the intention for Ireland to be an international leader in using AI to the benefit of business, public services and people. This will be achieved by fostering a people-centred, ethical approach to AI development, adoption and use. Aligned to this strategy, as regulators and industry operators alike consider the potential benefits of integrating AI into processes, the focus must remain on ensuring transparency, accountability, and ethical use.

Participants left the FSCC event with several learnings and key takeaways:

In terms of openness to AI – participants seemed open to the functions and the uses of AI; participants and panellists both displayed a realistic appraisal of the benefits of applying AI in the food sector, both for business and safety purposes, while acknowledging the corresponding challenges these technologies would bring.

One of the initial main drivers of AI adoption in relation to food safety as seen through the case studies, is to improve operational efficiency in how the agri-food sector meet their food safety compliance obligations. In some cases, while not necessarily the initial driver, this may also provide opportunities for improvements in food safety, for example improved identification of food chain risks and improved targeting of food safety interventions.

AI technologies present unique challenges that must be managed and mitigated, such as risks associated with bias and hallucinations. AI systems can reinforce existing biases, leading to unfair or discriminatory outcomes. This is often unintentional and occurs as a result of the tool reinforcing biases found in the underlying data.

Additionally, AI hallucinations – occasions where generative AI tools create false or misleading information - can pose serious risks if insufficient oversight is applied. AI hallucinations can vary in severity, ranging from a minor factual mistake to an entirely fictitious claim. The variety of severity of the hallucinations combined with the well-written nature of the hallucinated responses means that it can be difficult to identify immediately that the response contains inaccuracies. To address

[1] Ireland's National AI Strategy Refresh 2024

these challenges and mitigate risks, guidelines that promote transparency, accountability, and ongoing oversight must be embedded to ensure AI systems are reliable, accurate and ethical in their application.

It was clear from the discussions throughout the day that AI is already making an impact across sectors, demonstrating its practicality and effectiveness as evidenced by the speakers. AI covers a range of different tools which are rapidly becoming more accessible and readily available. As the number of tools available grows, the competition will also grow and businesses will have a greater array of off-the-shelf and bespoke tools to choose from; it is unlikely that accessibility or availability will reduce in the short term, even considering the implementation of regulations like the EU AI Act.

In the *Guidelines for the Responsible Use of Artificial Intelligence in the Public Service*[2] (May 2025), the Government has made a commitment that AI tools used in the public service must comply with the EU principles for trustworthy AI. For regulators like the FSAI, the impact of AI must be considered both from the perspective of benefitting regulatory approaches, but also from a perspective of food businesses who implement AI, considering what risks and opportunities may emerge. This means implementing strategies and human oversight to make sure we harness the potential while mitigating risks.

The adoption of AI tools for food safety, in industry or for regulation, should be for the purpose of reinforcing and optimising existing mechanisms, rather than circumventing or replacing them. AI can enhance decision-making by analysing complex datasets, identifying patterns, and improving efficiencies. However, its deployment must be carefully designed to uphold established processes, ensuring that human expertise, scientific rigor, and ethical considerations remain at the core of every AI-driven food safety solution.

A lesson that emerged repeatedly throughout the event was the benefit of going back to basics – the data. A key takeaway was the importance of robust, high-quality data. Using data as a strong foundation is crucial for developing accurate and reliable AI models, ensuring that AI solutions are both effective and scalable. Data serves as the backbone of these technologies, directly influencing their performance, reliability, and trustworthiness. By prioritising robust data management practices and maintaining a strong foundation of well-curated data, businesses from any sector can develop AI solutions that deliver accurate, consistent, and meaningful results. Neglecting this essential foundational step would compromise the integrity and efficacy of AI applications. The future of AI in food safety requires a balance between innovation and responsibility.

[2] Guidelines for the Responsible Use of Artificial Intelligence in the Public Service

Reflecting on the Open Meeting, the FSAI and FSCC event objectives were achieved through information sharing, learning, and open discussion on challenges and opportunities. The stakeholder engagement and consultation from the Open Meeting will support the FSAI and its stakeholders in addressing these as the contribution of AI to the food sector continues to evolve.

The FSAI is grateful to its FSCC for providing the forum, through the open meeting for a constructive and open examination of important food safety topics which supports the FSAI in delivering its vision of safe and trustworthy food for everyone.

Members of the FSCC (February 2025)

Chair

Jamie Knox, Keurig Dr Pepper Ireland

Deputy Chairs

Dave Lang, Associated Craft Butchers of Ireland

Paula Barry Walsh, Department of Agriculture, Food and the Marine (retired)

Members

Adrian Cummins, Restaurants Association of Ireland

Alice McGlynn, Consultant to Food Industry

Annette Sweeney, Technological University Dublin

Catherine Morrison, Bord Iascaigh Mhara

Conor Mulvihill, Dairy Industry Ireland, Ibec

Dale Crammond, Meat Industry Ireland, Ibec

Deirdre Ryan, Bord Bia

Dermott M Jewell, Consumers' Association of Ireland

Eamonn Quinn, Kelsius

Elaine Clohosey, BWG Foods

Janis Morrissey, Irish Heart Foundation

Jonathan Griffith, Irish Health Trade Association

Louise Reynolds, Irish Nutrition and Dietetic Institute

Mark Christal, Enterprise Ireland

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Paul McKeown, Health Protection Surveillance Centre

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