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## Sensory Food Network Ireland



### Key external stakeholders:

The Irish and international food and beverage industry.

### Practical implications for stakeholders:

Sensory Food Network Ireland achieved full integration as a group, sharing activities, resources and co-delivery of workshops and bespoke in-house training sessions to companies and stakeholders. Up-to-date information, advice and support on various aspects of food sensory testing continues to be available to stakeholders, through direct contact with any of the network partners, listed below.

### Main results:

- A comprehensive network of sensory researchers has been established, developing a new combined national competence in sensory food science on the island of Ireland.
- The research programme arising from the network has led to new national and international research links being formed, with three sensory science-focused postgraduates completing their studies. The three projects were:
  - a. Emerging sensory techniques.
  - b. The utilization of a chemometrics/sensometrics approach to optimize sensory and chemical techniques/data using Cheddar cheese as a model food.
  - c. Consumer perceptions of beef - a comparison of consumers from different regions.

Results obtained from the research programme were published in academia and also had high applicability to the food and beverage industry.

- A significant undertaking of client work for the food industry was also completed, demonstrating the benefit of having all of Ireland's sensory expertise under the one national umbrella of Sensory Food Network Ireland.
- A range of training workshops and bespoke in-house training was completed.
- The international profile of the network was established through successfully negotiating membership of the European Sensory Science Society (E3S), which led to securing the bid to host the first international sensory science conference in Ireland. Many Sensory Food Network Ireland partners currently sit on E3S working groups and also on the board of E3S. This international collaboration has served to raise the international profile of sensory science research and capabilities in Ireland. Additional international research links were fostered with sensory groups in the UK, China and USA.

### Opportunity / Benefit:

An integrated network of researchers has been established across 10 academic institutions on the island of Ireland, offering collaborative sensory-focused facilities, knowledge and skills to the food and beverage industry for sensory, R&D and consumer-related projects.

### Collaborating Institutions:

Agri-Food and Biosciences Institute (AFBI), University College Cork, University College Dublin, Technological University Dublin, St Angela's College, Galway Mayo Institute of Technology, Ulster University, Limerick Institute of Technology, College of Agriculture Food & Rural Enterprise (CAFRE).

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## 1. Project background:

Sensory Food Network Ireland was established as a national network of excellence, promoting integration and ensuring sustainability for all sensory science activities on the island of Ireland. The network aimed to perform to the highest level of excellence in service provision to industry and scientific research in sensory food science. All members of the network have been dedicated to developing and improving sensory research and consumer testing methodologies, with the aim of launching Ireland on the international map in this field – a key performance indicator which was achieved. A key aspect of the network was to strengthen existing scientific and technological excellence in sensory science by aligning the critical mass of resources and expertise needed to provide leadership and to be a future international force in this area. This expertise was networked around a joint programme of activities in research, training and service provision. This programme served to enhance the research capacities and services of the network partners while at the same time advancing knowledge in the area of sensory food science.

Recognising the importance of sensory science in the food industry evolved from the increasing need for a scientifically sound and systematic approach to the sensory evaluation of foods. In food companies, sensory food science now has considerable value for both tactical and strategic research goals. Collaboration between industry and research groups was a fundamental pillar of activity for the network. Sensory Food Network Ireland provided, and continues to provide support for the food and beverage industry in the areas of new product development, product matching, flavour development and enhancing understanding of consumer behaviour within specific market segments.

## 2. Questions addressed by the project:

- Can the sensory expertise and capabilities from 10 research institutions across the island of Ireland be integrated to address the needs of the food industry in relation to sensory science?
- Does geographical location influence consumer preference of beef?
- Can rapid sensory methods be applied to generate comprehensive sensory profiles of food products?
- Can a chemometric statistical approach be used to build a flavour profile of a product using data derived from descriptive sensory methods and advanced chemical techniques?

### 3. The experimental studies:

To strengthen scientific sensory capability within the network, a **research programme** comprising three distinct postgraduate research areas/projects was developed. These three projects were:

1. Emerging sensory techniques.
2. The utilization of a chemometrics/sensometrics approach to optimize sensory and chemical techniques/data using Cheddar cheese as a model food.
3. Consumer perceptions of beef - a comparison of consumers from different regions.

### 4. Main results:

1. **Emerging sensory techniques:** Rapid (Napping) and traditional (QDA) sensory evaluation methods of an Irish PGI product was completed. A cultural comparison consumer test with an Irish PGI food product was also completed. Sensory, consumer and instrumental testing using a product from an Irish SME generated a comprehensive product profile and demonstrated to small artisanal producers how important their individuality is in the Irish food market. This project added to the research base in terms of skills such as panel leader skills for a trained panel and consumer testing. This project has contributed to the research base of the Irish food industry, especially for small SMEs, as they had access to sensory, consumer and instrumental food analysis testing that they would not have had access to as a smaller food company. Consumer testing skills were gained with the cultural comparison study of Irish and UK consumer liking of a traditional Irish product.
2. **The utilization of a chemometrics/sensometrics approach to optimize sensory and chemical techniques/data using Cheddar cheese as a model food:** The chemometric approach used in this project identified correlations between some specific biochemical, compositional, rheological, flavour chemistry and sensory data with sensory preference, using cheddar cheese as the model system. Some of these were obvious and well established, however others were novel and unexpected. The importance of pH and calcium content in relation to rheological and sensory aspects of the cheese provided additional useful information, along with the extent of proteolysis and abundance of some specific amino acids with crumbly texture. The importance of the extent of proteolysis in proportion to cheddar maturity was re-affirmed, however the complete absence of lipolysis with the same was novel and insightful. Typically the sensory panel preference correlated with age of maturity of the cheese, as anticipated, however some strong associations were found between some individual aromatic molecules, such as methyl ketones with cheddar flavour, aroma-liking and sour taste. Salt taste perception was also strongly linked to the abundance of specific amino acids. Some associations of specific free amino acids with liking of flavour, fruity aroma and sweetness were also evident. Other volatile compounds such as specific aldehydes, acids and ketones were correlated with extent of cheddar maturity. For example 2,3-butanedione (diacetyl) was correlated only with mild cheddar, this is a product of lactose metabolism which is utilised completely in the early stages of cheese ripening. Its relevance diminishes with ripening due to the accumulation of other odour active molecules.  
This approach has huge potential to better understand important drivers to sensory perception in complex foods. The outcomes are directly related to the extent and quality of data available. Preliminary studies to highlight important trends are useful so that time and effort can be concentrated the most relevant analysis. This approach has potential in fine tuning production processes to maximise perception, alleviate off-flavours, increase product consistency and potentially extending shelf life and product quality.
3. **Consumer perceptions of beef - a comparison of consumers from different regions:** Research to evaluate the impact of geographical location on consumer responses to grilled beef showed that there were no differences between regions in terms of consumer preferences for different qualities of beef. However, there were differences between locations in absolute score, with consumers in Reading, GB scoring more highly than those from Cork, Ireland and Belfast, NI. Socioeconomic studies showed that this was not related to age, gender or income but may have been due to consumers in GB tending to eat lower value cuts. This may have lowered their expectations, resulting in higher scores. The range of beef treatments used for these studies included dairy and continental beef breeds, Achilles and Tenderstretch hanging, steers, bulls and older cows. The consumers were able to clearly differentiate between these treatments, with the dairy-breed steers being most liked. This study demonstrated that an accepted international standard method using naïve consumers can differentiate clearly between treatments. It also showed that panels conducted on the island of Ireland may be used to determine the likely consumer responses from GB, with no

differences in preference evident. This may contribute to decisions made by the industry or funding bodies, regarding where such panels could be conducted.

**Other outcomes from the network:**

- An integrated team of sensory researchers has been established, which has delivered a comprehensive and ongoing sensory science service to the food and beverage industry and new national and international research links have also been developed.
- International recognition for Sensory Food Network Ireland was achieved when the network negotiated membership to the European Sensory Science Society (E3S) in 2015. The network is now firmly established on the European stage with membership of the board of E3S since 2017. In 2017, SFNI successfully bid to host the E3S annual symposium in 2018. Teagasc/Sensory Food Network Ireland hosted first Irish international sensory symposium in May 2018.
- A successful training programme for up-skilling of researchers and enhancing in-house industry sensory capabilities was established and rolled out to food companies. In-house bespoke sensory training has also been completed for a number of leading Irish food companies.
- Links and involvement with ISO standards have been developed. A training workshop demonstrating all relevant and contemporary ISO approved sensory methodologies in relation to food quality control was delivered by the network in March 2019.
- A national sensory conference took place in Ashtown, Dublin in September 2019. This conference covered new sensory insights and research dimensions coupled with relevant industry case studies involving SMEs and multinational food companies.
- An integrated and wide-ranging dissemination programme of events was delivered by all network partners throughout the lifetime of the project. These included public events, TV appearances, school visits and guest lectures. A range of key sensory-focused workshops and conferences addressing industry needs were designed and co-delivered by network partners during the project.

**5. Opportunity/Benefit:**

An integrated network of sensory researchers has been established across 10 academic institutions on the island of Ireland, offering collaborative sensory-focused facilities, sensory knowledge and skills to the food and beverage industry for sensory, R&D and consumer-related projects.

**6. Dissemination:**

- Nine peer reviewed scientific publications.
- 36 scientific/technical articles and abstracts, including conferences and popular publications.
- 20 oral presentations at conferences and workshops.
- Two PhD and one MSc Thesis.
- 21 outreach activities.
- Five national and international workshops/conferences.
- 40 commercial activities.

7. **Compiled by:** Dr. Eimear Gallagher, Dr. Emily Crofton and Dr. Sinéad McCarthy.