



# Cheese Extra:

The Functional Cheese





Cheddar Cheese is used in a variety of meals ranging from pasta and ready meals to burgers and savoury pastries. It has been a hero product across the globe both in and out of the home for decades. Cheddar Cheese adds something extra to a dish, whether you are looking for flavour or the perfect melt, it is a flexible product that can be manipulated in many ways to suit any scenario.

While Cheddar Cheese has many desirable characteristics there are some limitations on cooking. Cheddar Cheese can lose its shape, produce excess oil or brown too much when cooked or baked. Additionally, as the nutritional characteristics of many prepared meals, such as ready meals or pizza, comes under scrutiny, the relatively high fat content of Cheddar Cheese can be a cause for concern.

Even when faced with these challenges chefs, food producers and even, every day consumers are slow to move away from Cheddar mainly due to the concern of lack of taste. Taste is the number one driver of cheese purchases according to Mintel (Mintel, Ready meals can prove plant-based cheeses' credentials 2021).

Providing an alternative to Cheddar Cheese that offers the same great taste along with the functional and nutritional benefits will offer manufacturers a point of difference in the market.



'64% of global consumers say it is ok to enjoy the occasional moment of indulgence as part of a healthy diet.'

# KEY CONSUMER TRENDS

## HEALTH & WELLBEING

In a world that was previously obsessed with specific diets, 70% of people globally don't adhere to strict diets that omit certain food groups or promote eating at certain times of the day (Bord Bia, Dietary Lifestyles, 2021). People are becoming more aware of the benefits of a balanced diet and educating themselves on the nutritional benefits certain foods provide. Consumers are looking for food with higher nutritional benefits and healthier options of familiar food (Mintel, EMEA Regional 2021 Consumer trends 2021). According to FMCG Gurus, both protein and calcium are two of the top 5 desired benefits people want from their food (FMCG Gurus 2020).

The UK has begun tackling childhood obesity by starting the process to end the promotion of high fat, sugar, and salt (HFSS) products. The UK government are introducing new legislation in early 2022 to restrict promotion of HFSS products. There is a clear focus on products that are contributing to childhood obesity. The UK is one of the first countries to proposed this type of legislation, it will result in companies looking for ingredients with improved nutritional content for use in their products.

## BACK TO BASICS

Consumers are looking for more natural food products, that have shorter ingredient lists.

During the past 18 months, people have returned to their kitchens with 45% of people now preferring to cook from scratch (Bord Bia, Dietary Lifestyles 2021).

As people are more aware of the products they are using in the kitchen, they are looking at the ingredients on back of pack. Over one third of global consumers are now more attentive to the quality of ingredients in products (FMCG Gurus 2020).

## PERMISSIBLE INDULGENCE:

Consumers do not want the healthiest products but better-for-you products as they look to combine taste and nutrition in a convenient and guilt-free manner. 64% of global consumers say it is ok to enjoy the occasional moment of indulgence as part of a healthy diet (FMCG, 2020).

Baked goods are not always perceived as healthy options for consumers, but there is an opportunity in the bakery industry as savoury flavours are becoming more prevalent in an aim to reduce sugar intake (Mintel, The Future of Bread, Bakery and Cakes: 2021). The prevalence of home baking was very high in the past year with consumers enjoying the experience of baking at home and the comforting aroma of baked breads and pastries.

# CHEESE EXTRA

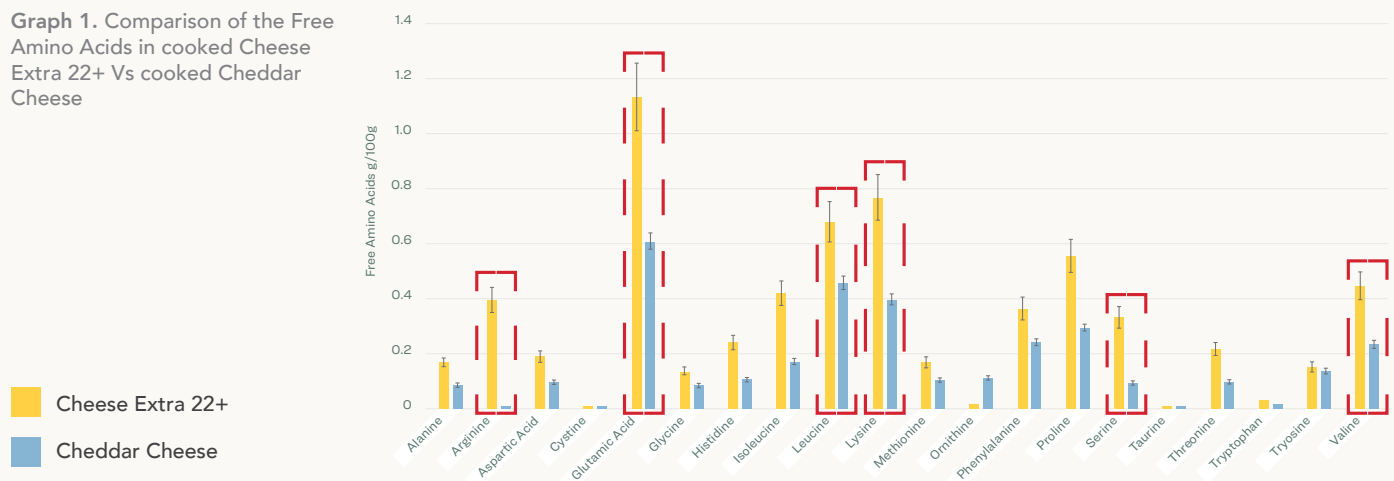
Cheese Extra has been developed for manufacturers of ready meals, bakery, pizza and other prepared foods. It is a natural product made with milk from grass fed cows, that delivers great taste as well as functional and nutritional benefits in response to key consumer trends. The range includes 22+, 14+ and 10+.

Cheese Extra addresses key market trends, as well as the limitations Cheddar has in cooked and baked applications. In a host of baking scenarios, these products will hold their shape much better, while also delivering a distinctive umami flavour and reduced oil out. The Cheese Extra range delivers the low browning that many applications require. The nutritional value of Cheese Extra supersedes that of Cheddar Cheese, with higher protein and calcium levels and a lower fat content. Cheese Extra delivers these benefits without compromising on taste, with the depth of flavour increasing as the product is cooked.

## TASTE:

Cheese Extra delivers a comparable flavour to that of a Cheddar Cheese when cooked and has a more distinctive cheesy note. When evaluated, Cheese Extra has higher levels of free amino acids when compared with Cheddar. The largest difference can be seen in the free glutamic acid content. There are significant differences in the levels of all free amino acids, in particular Lysine, Arginine, Leucine, Serine and Valine. All of this contributes to the increase in umami flavour we see in Cheese Extra compared to Cheddar Cheese.

Graph 1. Comparison of the Free Amino Acids in cooked Cheese Extra 22+ Vs cooked Cheddar Cheese





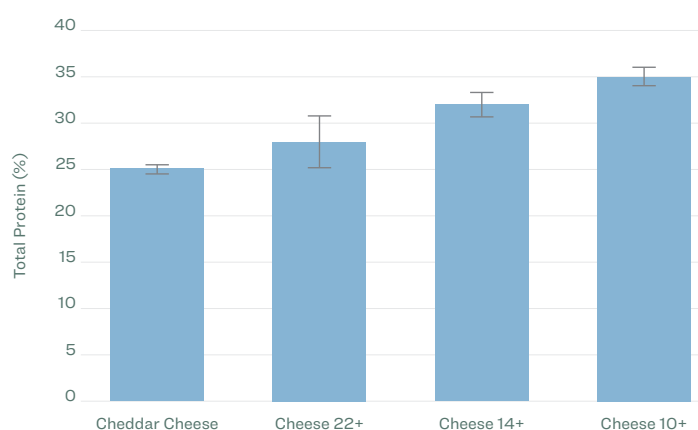
## NUTRITION:

Cheese Extra has an improved nutritional profile compared to Cheddar Cheese – it is lower in calories and fat but higher in protein and calcium.

Protein and calcium are naturally much higher in the Cheese Extra range with the benefit of a lower calorie intake. Cheese Extra is also a great source of Phosphorous, Vitamin B12, A, B2 and Folic acid. As consumers are becoming more conscious of the nutritional profile of the food they are eating, Cheese Extra is a prime example of a food where they don't need to sacrifice on flavour or enjoyment to achieve the nutritional benefits.

Table 1. Nutritional Profile of Cheese Extra range V's Cheddar Cheese

Nutrient per 100g	Cheese Extra 22+	Cheese Extra 14+	Cheese Extra 10+	Cheddar
Calories	302	238	230	390
Kjoules	1258	996	961	1630
% Energy from protein	37%	56%	61%	25%
Fat (total) g	22	14	10	32.5
Saturated Fat g	13.9	8.8	6.3	21.2
Protein g	28	32	35	25
Calcium mg	850	999	1153	700
Phosphorous mg	560	643	645	500



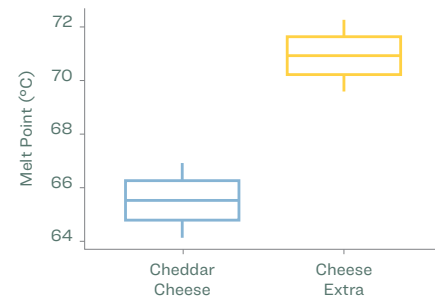
Graph 2. Protein content in Cheese Extra is significantly higher than Cheddar Cheese

## FUNCTIONALITY: STRUCTURE & MELTABILITY OF CHEESE EXTRA

The matrix structure of cheese plays an important role in the mechanical, rheological and cooking properties of cheese.

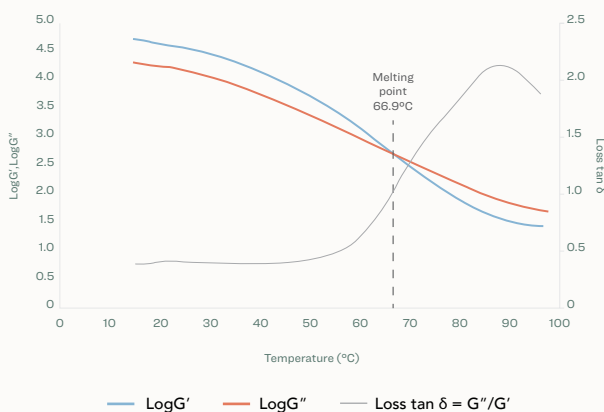
Cheese Extra has different melting and flow characteristics compared to Cheddar Cheese. Due to the high protein and calcium content in the 3D matrix, the cheese is firmer causing an increase in rigidity, elasticity and hardness as well as reduced meltability. When Cheddar is used in baked products, the cheese tends to melt excessively and disappear into baked products. The properties of Cheese Extra means the cheese is more visible in application and more structured with less melting off than Cheddar.

We determined the melting point of a standard Cheddar Cheese versus Cheese Extra using a rheometer. Graph 4 demonstrates that the melting point is higher for Cheese Extra than Cheddar Cheese. The melting point is higher by an average of 5.4°C which helps explain why Cheese Extra is more visible after cooking.

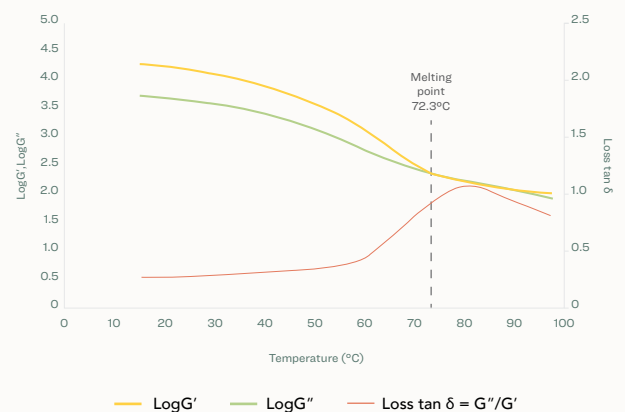


Graph 3. The melting point of Cheddar Cheese Vs Cheese Extra

Cheddar Cheese



Cheese Extra



Graph 4. The melting point of Cheddar Cheese is reached at a much quicker rate than that of Cheese Extra



## TEXTURE OF CHEESE EXTRA

The main structural component of cheese i.e. the cheese matrix is made up of a casein micelle network held together by calcium phosphate links, in which fat globules, water, minerals, bacteria, and dissolved solutes such as lactose, lactic acid, soluble salts, and peptides are all interspersed. Confocal Laser Scanning Microscopy can be used to show how the matrix differs as the fat is reduced, see Figure 1 below. The green represents the fat and red represents the matrix network. You can see in Cheese Extra 22+ and 14+, that the 3D network has increased as the fat is reduced.

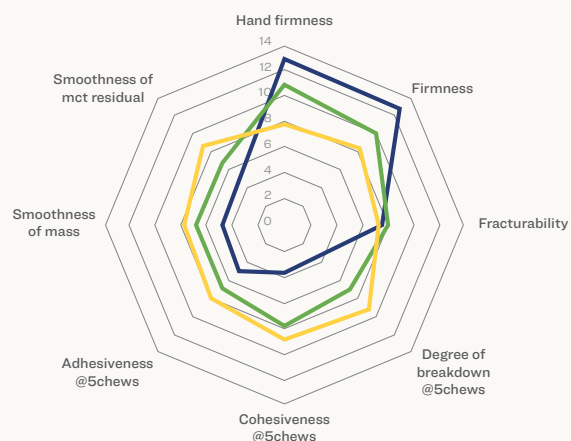
Figure 1. The increased 3D network affects the texture of the cheese, illustrated in graph 5.



Graph 5. Texture of Cheese Extra

As the fat content in Cheese Extra is reduced the cheese firmness increases, holds its shape better and exhibits less adhesiveness which results in improved baking properties

- Cheese Extra 22
- Cheese Extra 14
- Cheese Extra 10





# CHEESE EXTRA IN APPLICATIONS

Cheese Extra has been tested by our culinary experts to understand how the 22+, 14+ and 10+ perform in different applications and under various cooking and baking conditions. The functionality, taste and nutritional attributes mean Cheese Extra is versatile across bakery, ready meals, pizza and sauces.

## CHEESE EXTRA AND BAKERY

Creating a great savoury baked product with cheese is dependent on three factors, you need to be able to see, smell and taste the cheese. Cheese Extra achieves this because it has a superior matrix structure to traditional cheese that makes it more heat stable for baking. On baking, Cheese Extra also has a much higher content of glutamic acid giving the baked product an enhanced umami flavour.

In a croissant application, Cheese Extra 22 outperforms its Cheddar counterpart in umami, saltiness, cheese flavour intensity and cheese flavour impact. The Cheese Extra croissant has a more balanced and savoury flavour in comparison to the Cheddar and the sensory panel had an overall preference for a croissant made with Cheese Extra 22, making it the go to cheese for laminated dough products.

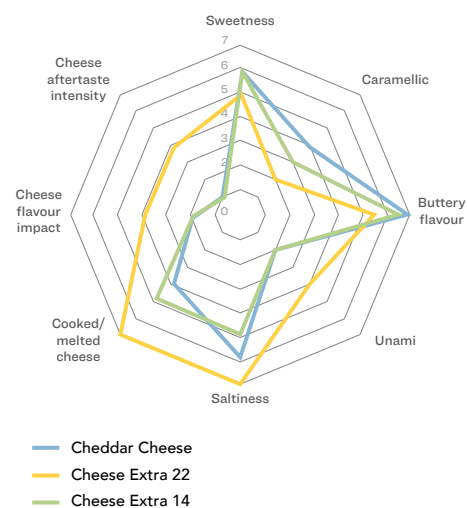


Cheese Extra filled Croissant



Cheddar Cheese filled Croissant

Graph 6. Sensory Profiling of Cheese Filled Croissants



In biscuit applications, Cheese Extra produces a better tasting biscuit with lower browning, reduced oil out and a more uniform cooking. Cheddar Cheese tends to release more oil resulting in the excessive browning of the cheese and the frying of the base of the biscuit.

#### Browning Comparison



In comparison to Cheddar, Cheese Extra has a number of functional, nutritional and flavour benefits in bakery applications including:

- Higher protein
- Lower calories
- Lower browning
- Superior heat stability
- Reduced oil out
- Savoury and umami flavour boost



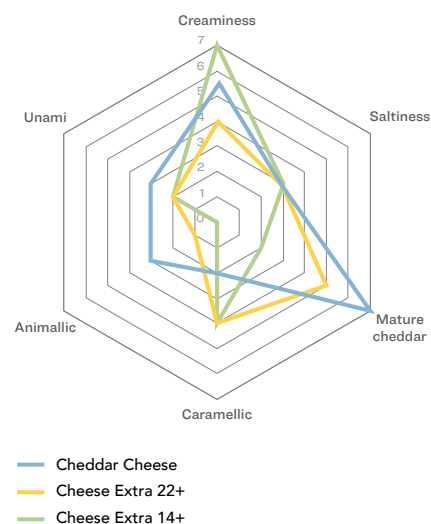
## CHEESE EXTRA AND SAUCES

Cheese Extra is ideally suited to sauce applications. Cheese Extra has increased caramellic notes and the Cheese Extra 14 has increased creaminess in comparison to a Cheddar.

This makes it a suitable candidate for ready meals and sauces, especially when there is an increasing demand for lower calorie meals.



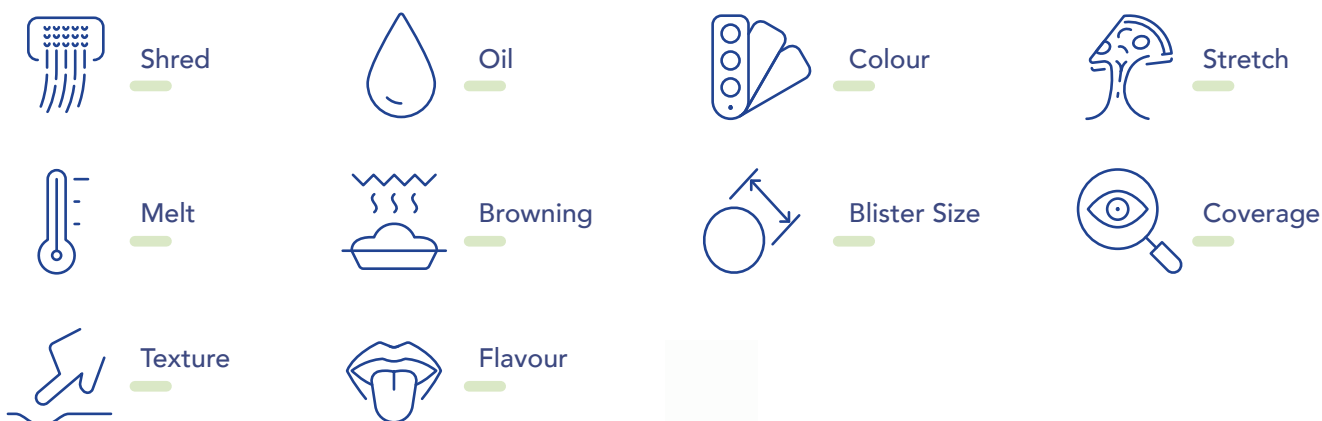
Graph 7. Profiling Cheese Sauce



## CHEESE EXTRA AND PIZZA

Cheese Extra has been tested in shredded blends with Mozzarella, ideal for use as a pizza topping. Cheese Extra improves the overall flavour of the pizza without excessive oil out or blistering. It has similar or lower fat content to traditional Mozzarella, making the Cheese Extra range the perfect partner to blend with Mozzarella.

The following pizza testing parameters were observed:



The addition of Cheese Extra 22 & 14 to a Mozzarella blend can help elevate overall flavour and gives;

- Reduced visible oil film
- Excellent stretch
- Balanced savoury notes and umami boost
- Superior nutritional credentials

## CONCLUSION

Given the popularity of cheese, Cheddar Cheese can be the centre of many meals. However, in some cooking and baking scenarios there is a desire for a more functional and nutritional product. Cheddar Cheese tends to lose its shape when cooked and excess oil out can make it difficult to work with in bakery or pizzas for example. Cheese Extra can offer increased functionality, reduced fat, higher protein and lower calories with no compromise on taste.

Available in 10, 14 and 22 variants, Cheese Extra delivers the cheddar taste that consumers demand, but with added functionality during the cooking and baking process.

10 with just 10% fat, this is an excellent choice for the health conscious consumer. It's a good substitute for Cheddar or Feta Cheese in salad bowls or healthy snacking options. Very low levels of oil-out and a balanced cheesy taste typify 10. This is a very dependable and consistent option as its core characteristics don't change during maturation, thanks to the higher protein element.

14 with 14% fat, this is an excellent choice when it comes to delivering a consistent and even melt, with a lower level of oil-out. It works particularly well in sauces or adds a rich, creamy taste to ready meals. It is an ideal 'best of both worlds' solution in terms of maintaining a full fat taste with deep savoury notes and offers an excellent level of structure and strength.

22 with 22% fat, this is the perfect option when you want a full round taste with deep savoury notes. It holds its shape and structure superbly well across a wide range of baking and mixing applications. It works particularly well in baking and ready meal formats, and when combined with Mozzarella delivers an extra cheesy note to pizza while also giving excellent stretch and low browning .



# WHY YOU SHOULD PARTNER WITH CARBERY

## 4 GOOD REASONS



### 1 DEDICATED CHEESE PRODUCTION

With an experienced shareholder group of dairy farmers and a dedicated cheese production facility, we produce cheese all year round. We have the capacity to produce 300 tonnes of cheese each day using grass fed milk with no hormones or antibiotics.



### 2 OUR RECORD OF INNOVATION

Our inhouse starter culture programme gives us the flexibility and the agility to tailor our cheeses to specific markets, tastes or functionalities. And in addition to our own R&D experts, we also work in tandem with a number of external research partners, broadening the scope of our innovations.



### 3 OUR OPERATIONAL EXCELLENCE

Whether on our farms or in our processing operations, we operate to the highest standards of production excellence, and meet or exceed all relevant statutory requirements. Our expert cheesemakers produce cheese all year round.



### 4 OUR BROAD PORTFOLIO

Our range of cheeses is made up of four core groupings:

- Natural Cheddar
- Cheese Extra
- Speciality
- Pasta Filata

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