April and October 2017

2017
Spring and Autumn Conference Proceedings

British Society of Baking
Affiliated to the American Society of Baking

British Society of Baking
Spring Conference 2017

26th April, Campden BRI, Chipping Campden

British Society of Baking
Autumn Conference 2017

11th – 12th, October, Woodland Grange Hotel, Leamington Spa

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2017 SPRING CONFERENCE

Paul Turner, BSB Chairman

Paul Turner opened the conference by welcoming delegates and guests, giving an update on recent BSB activities and thanking Campden BRI for the use of their excellent premises, for their cooperation in the planning of the conference and for the help of many Campden BRI staff in the running of the conference. He then asked Laura Gambrell to read the BSB Creed.

Laura read the BSB creed.

Paul Turner Thank you Laura. I would now like to introduce this morning's Session Chair, Sylvia Macdonald. Sylvia studied with the Chartered Institute of Public Relations before doing a three year diploma course in journalism and ultimately being editor of British Baker for many years. Sylvia says that the whole business of daily bakery manufacturing and distribution of the most delicious products made by some of the friendliest and most passionate people is what drew her to this trade, and she loves writing about it. Having interviewed everyone from craft bakers to Jonathan Warburton, and ingredient manufacturers to Justin King, she says bakery is primarily a very challenging business and she looks forward to today's speakers tackling some of those challenges. Please welcome Sylvia.

Sylvia MacDonald, Session Chair Thank you ladies and gentleman and Paul, shall we get started right away? Our first speaker is known to many of you - a leading scientist in the bakery sector, Gary Tucker is at the forefront of changes happening in product development. Most relevant of all at the moment is sugar. Now, Gary has addressed the Society before on sugar but have things changed? Oh, they certainly have. Can we stay one step ahead of Government and reduce sugar in cakes? It is a question vital to this sector and to give the answers, please welcome leading scientist Gary Tucker.

Tackling the Issue of Reducing Sugar in Cakes by Gary Tucker, Head of Baking & Cereal Processing Campden BRI

Thank you very much Sylvia. We are delighted to have the BSB here and I can see so many familiar faces in the audience, which is great. The content of my talk will cover the following:

- Update on sugar issues in the UK – the challenges facing the industry
- Functions of sugar in cake and the alternatives
- The future

I'm going to focus on a couple of the functions of sugar in cake which I mentioned in the talk I gave at the Autumn 2014 BSB Conference since I think they are the most relevant to the challenges that the baking sector faces. Then a few words about the future and this is where I have changed my paper a little bit, because the 20% reduction in sugar that the Government wishes to recommend to the food industry does have some major implications for the cake manufacturing sector.

Update on sugar issues in the UK

- UK government published draft legislation for a tax on sugar-sweetened drinks, to begin from April 2018.
- Ministers hope it will help tackle the obesity problem.
- Two bands; >5g of sugar per 100ml and a higher band for drinks with >8g per 100ml (amounts to an extra 6p on a regular can of Fanta and Sprite, and 8p on Coca-Cola, Pepsi and Irn-Bru).
- Many companies have already begun cutting the amount of sugar in their drinks.
- The government has said it expects the levy to raise £520m in the first year.

The Sugar Claims slide is about what's happening in the drinks sector, which is clearly a target for sugar reduction. As mentioned above, draft legislation is prepared and ready to be implemented in April of next year and the Government is hoping to raise £520 million in the first year. Whether it will or not remains to be seen because already the major drinks companies are making changes in reducing the sugar in their products. Reducing sugar is relatively straightforward for the drinks sector, without belittling that sector, because the sugar is there primarily for flavour, so it's not as complex a change as it is with the bakery sector.

I put the sugar claims slide in because there are certain claims that can be made but not many are relevant to cake. Clearly, it's unlikely that a cake is going to be low-sugar, unless it's a savoury cake and that will have a completely different flavour; similarly sugar-free, that's not really likely; no-added sugars, possibly; reduced sugar is certainly a claim that can be made and the rules haven't changed on that - you need to make a 30% reduction in

sugar compared to a comparable product to be able to make the claim.

What is next?

- Other high sugar products will follow such as bakery products '.....they are high in free sugars but offer little nutritional value'.
- 20% reduction by 2020 (PHE, 30 March 2018)
  1. Reformulating
  2. Reducing portion size
  3. Shifting consumer purchasing habits
- Includes all sugars whether added or natural
- Without increasing saturated fat or calories

When I started to write this paper a few weeks ago there was a lot of material that was in draft that has now come out in print. The bakery sector is certainly going to have to follow the drinks sector in one way or another with sugar reduction because it's been highlighted that, and these are words taken from the Public Health PHE document that came out at the end of March; 'bakery products are high in free sugars but offer little nutritional value.' What PHE are looking for is a 20% reduction across bakery categories by 2020.

Sugar reduction: Achieving the 20%

- The PHE recognise some businesses will need technological solutions to achieve sugar reductions, but encourage industry to consider simple solutions first.
- Data from the National Diet and Nutrition Survey showed foods that contributed most sugar to children's intakes are: biscuits; breakfast cereals; cakes; chocolate confectionery; ice cream, lollies and sorbets; morning goods (e.g. pastries, buns and waffles); puddings (including pies and tarts); sweet confectionery; sweet spreads and sauces; and yogurt and fromage frais.

The above are based on sales weighted averages. There are some products within the bakery morning goods sector that are high in sugar but their sales are quite low, so to achieve the 20% reduction across that category could be a challenge. Cakes are probably different because most cakes do have a high level of sugar and the levels are not as variable as perhaps they are in morning goods.

The recommendations document from PHE is about 110 pages long and I have read the relevant bakery sections very carefully. They are suggesting three approaches: 1) a reformulation exercise to reduce sugar. 2) accepting that this might not be possible in all cases, a portion size reduction would be possible. 3) shifting consumers' purchasing habits towards lower sugar versions of the same or a similar product. So those are the three recommendations from the PHE that the bakery sector has to work on.

It is interesting that the recommendations now include all sugars, whether they're natural or added, so the fact that you're using honey or some other natural material in a bakery product is irrelevant now. It contains sugars that can be be analysed, they count.

The last recommendation is a great one for the cake sector - you have to do the sugar reduction without increasing the saturated fat or calories in the product. That is not easy to do because if you take sugar out, the proportion of the other ingredients goes up. This includes fat, which is a very important ingredient in cake manufacture. Fat has many functions in cake manufacture and when we reduce sugar, the proportion of fat will go up. So reducing sugar in a cake recipe without increasing the saturated fat or calories in the cake is quite a challenge for the cake making sector.

It is good that PHE recognise that businesses will need to make, or find, technological solutions to achieve the sugar reductions and that they encourage industry to consider simple solutions first. I don't actually know what the simple solutions are for cake but we will come to that later. They highlight some of the categories that are most relevant to children, because that's of primary concern to PHE.

Data from the National Diet and Nutrition Survey contains a lot of products that are in the bakery sector. I've underlined cakes because that's the subject of this particular presentation.

How is sugar content defined?

"Carbohydrate .... of which sugars"

- Regulation (EU) No 1169/2011 FIC defines sugars for labelling purposes as the sum of all monosaccharides and disaccharides present in food, but excludes polyols.
- Monosaccharides - glucose, fructose, galactose
- Disaccharides - maltose, sucrose, lactose
- Therefore no higher sugars such as maltotriose.

The above table looks at how sugar is defined since the EU regulation defines what sugars we need to reduce, measure and label. There are in fact quite a lot of sugars that aren't mono and disaccharides but they're not within that regulation. I also don't know what it means about the zylans, which are a five carbon molecule; they're certainly not a monosaccharide and they're not a disaccharide. Again, life is never straightforward, so even within the regulation it's starting to get a bit complex.

The analysis of sugar content is not straightforward, see methods below.

Analytical methods

- Most common is HPLC - gives a profile - requires capital investment and analytical skill
- Enzymatic - specific to each sugar, analytical dexterity required
- Titration of reducing sugars (Lane Eynon and Luff Schoor) - gives total sugars after inversion of sucrose with acid
- Brix refractometry - use with caution, measures dissolved solids not specifically sugars, is matrix dependent

Below is the functionality of sugar in cake. If we're trying to reduce sugar in cake these seven functions have to be addressed in the recipe reformulation.

The Functionality of sugar (in cakes)

1. Flavour
2. Bulking agent
3. Stabilises and controls batter viscosity
4. Influences the setting temperature

5. Colour (Caramelisation and Maillard)
6. Humectant (preservative)
7. Softens the texture

There are probably others as well but these are the seven we focus on when we're doing a training course or a product development activity. The two in red are the ones I want to highlight – sugar's contribution to flavour and sugar's action as a humectant. It is obvious that sugar gives sweetness to cakes but its action as a humectant is a very important function.

1. Sugar's role in flavour (sweetness)

- Sucrose is often referred to as sugar
- Sugars give sweetness - obvious statement but important - industrial cakes contain a lot of sugar so sweetness is less important for sugar reduction
- Sweetness can mask bitterness
- Natural sugars are blends that give complex flavours (e.g. Honey)

Cakes for national retailers tend to be very sweet. This is because they have to have a mould free shelf-life (MFSL) that allows time after production for storage and distribution; storage within the store until they are purchased; plus storage time at home before they are eaten. In order to get the shelf-life required the cakes need to have a level of sugar that delays mould development for the required shelf life. The cakes have a sweet flavour but I think most people would agree that we could reduce the sugar content by 20% without negatively affecting the flavour. It would however affect the other functions of sugar in cake production and storage, in particular the MFSL.

Industrial Cakes Are Very Sweet

'Industrial' cakes are very sweet

Typical bakery products per 100g (%)			
	Pound cake	Wholemeal bread	Madeira cake
Protein	6.0	10.0	5.3
Carbohydrate	49.0	37.8	56.4
Sugars	28.0	4.1	34.2
Fat	20.0	1.8	15.2
Saturates	12.0	0.4	9.2
Fibre	0.5	6.8	1.1
Salt	1.0	0.9	0.7

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The above slide illustrates the levels of sweetness in three products. The pound cake is one of the most common recipes for a cake, particularly for home baking, since each ingredient, (i.e. sugar, butter, egg and flour), is the same weight. The pound cake contains 28g sugar in 100g of cake. This will vary from pound cake to pound cake, depending on the type of fat you use, but approximately it is 28g per 100g of cake. Madeira cake, which is an enriched cake, has around 34g of sugar per 100g of cake. I have put wholemeal bread in there just to illustrate the difference between a bread formulation and a cake formulation, not that we really need to have it!

What's interesting about the above figures is that PHE would like the 20% reduction in sugar by 2020. If you look at the sales weighted average sugar levels for cake, they're at 34.9g and that's been calculated from between 100-200 different samples, so that Madeira cake is quite representative. If you reduce sugar by 20% in the Madeira cake, you bring its sugar level down very close to that of the pound cake. So in terms of sweetness we can take sugar down from the current quite high levels and still have a product that would be acceptable to consumers in terms of flavour.

Name	Sweetness
Lactose	0.27
Lactitol	0.4
Sorbitol	0.6
Erythritol	0.81
Sucrose	1.00 (reference)
Fructose	1.70
Stevia	40 – 300
Aspartame	180 – 250
Saccharin	300 – 675
Sucralose	300 - 1100
Nutrasweet	7,000 – 13,000

Alternative sugars (sweetness)

High fructose corn syrup

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We can use alternative sugars with higher sweetness levels to maintain sweetness when reducing the sugar content in cakes. Fructose would be a convenient one to use but I don't think the PHE would be very happy because high fructose corn syrup has had a bad press in the USA as one of the causes of obesity. Unfortunately the high intensity sweeteners are not an option for bakery products. My personal view is that the lower level sweetness in cakes with reduced sugar content will not be a problem and the higher sweetness sugar alternatives are therefore not required.

High intensity flavour regions of products

- Was tried with salt reduction - top additions, layers, inclusions
- Sugar crystals on top of cakes will work if shelf life is short but the sugar will dissolve on longer shelf life cakes
- Fillings and icings can contain high sugar or high intensity alternatives - but caution with water migration if a_w is not matched

There are other options for high sugar intensity regions of cakes. Dried fruit, which is high in sugar, is a good example. When you bite into a cake product with a high sugar intensity region, such as dried fruit or sugar nibs, on top, you get a sudden hit of sugar.

The bread industry has tried the above in terms of putting salt crystals on top of bread products. A product called Soda-Lo, which was in a hollow crystal form with a high surface area, meaning you got a high intensity taste of salt, was used for this purpose.

The above is all very well except that in solution, things like salt crystals and sugar nibs don't work. Over shelf-life, you can also get migration of water from the product to

the salt crystals and sugar nibs due to osmotic pressure. So for the longer shelf-life products, these high intensity regions on the product surface do not work because they melt as they absorb moisture from the product. I think if the shelf-life was one to two days, as with some breads, there is a possibility of them working but not for the longer shelf life of cakes.

Sourdough An area that is of great interest to us for a number of reasons in terms of flavour is sourdough and sour starters.

Complex flavours: sourdough

- Numerous flavour compounds generated during bacterial and yeast fermentation
- Changes flavour profile so sweetness less relevant
- Some sugar generation during fermentation
- More acceptable to adults than children

I'll come back to sours and sourdough a little bit later because they have a big relevance to shelf-life.

2. Sugar's role as a bulking agent

- Sugars take up volume in a product
- You have to replace this when formulating lower sugar products, see alternatives below.
  - Polyols, fibres (inulin) offer bulking*
  - *Caution with sugar analysis method - can give falsely high values

I won't say much about the second function of sugar in cake, its role as a bulking agent, other than that if we take sugar out we need to put something else in its place if we want our cake mix to be the same batch size and the % fat content to be the same. Reducing sugar by 30% in the Madeira recipe for example without replacing it with another bulking agent, would reduce the weight of the total mix by around 10%, and increase the fat level of the cake by around 10%.

Bulking agents like inulin, highlighted in red, are very good at replacing sugar. However we have had some quite strange results from the sugar analysis of cakes containing inulin, where the amount of sugar in a reduced-sugar cake has appeared to have gone up and not down! This is not what you would expect and when we have calculated it, it is wrong since the sugar level has not gone up. We're not sure whether it's a result of the sugar analysis methods that are used, or whether there is contamination of inulin with sugars. We suspect the latter, so that's just a word of caution. Inulin has a range of molecular weight and within that range there will be smaller sugars present. Some of these are going to come up as sugar on the analysis method, which is why I mentioned analysis methods earlier. So be very careful and watch out for that.

3. Sugar's role in stabilising and controlling batter viscosity

- Sucrose dissolves in the aqueous phase of a batter - controls batter viscosity
- Stabilises the batter by preventing air bubbles from coalescing or rising, and suspending starch granules
- Hydrocolloids, gums, gels used to increase viscosity

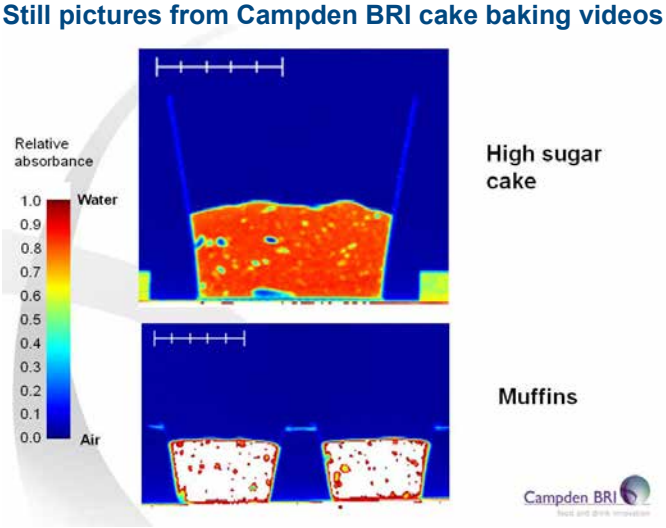
This is a relatively straight function to sort out, stabilisation of batters, when reducing sugar level. We want to entrap air bubbles in a batter during mixing and whisking, depending on the product; then retain the air bubbles in the batter as they expand air cells during the early stages of baking until the required rise of the cake is achieved, which is then helped by the raising agent to fill the air cells. There are several hydrocolloid gums that have the viscosity increase properties required, providing adding their name or names to the product label is not a problem.

4. Sugar's role in influencing the setting temperature of cakes

- Competition for water raises the starch gelatinisation temperature by affecting hydration
- Allows longer for the gases to expand and contributes to higher volume and softer texture
- Helps to create soft, 'almost' baked textures with muffins and brownies
- Other humectants do a similar job

An interesting role of sugar in cake is that sugar affects the temperature at which proteins coagulate and starches gelatinise. As the temperature of a cake batter increases during baking the batter expands and the cake rises. As the batter temperature increases proteins coagulate and starches gelatinise, resulting in a continual increase in the viscosity of the batter, making it harder for the cake to rise further once the viscosity has changed from a batter to, effectively, a set cake. Increased sugar raises the temperature at which proteins coagulate and starches gelatinise and it can raise the temperature from 60˚C to almost 100˚C. So for the industrial or the retailer type cake that has a high level of sugar for shelf-life, the setting point of the batter can be around 90˚C-95˚C, so it remains soft for longer and achieves maximum volume.

Still pictures from Campden BRI cake baking videos



Now, we have these lovely movies that if any of you have been to training courses at Campden BRI, you will have seen these. These were taken a few years ago for the high-sugar cake, which has now disappeared, and for muffins. They're taken by an x-ray camera and they show the way that these two high-sugar products rise during baking. The video shows that the rise of the cakes carries on almost to the end of baking and then there's just a little settling back. If it had been a low-sugar product, cake rise

would have stopped earlier. The role of sugar in creating the crust colour is another function of sugar, brought about by caramelisation and Maillard reactions.

5. Sugar's role as a humectant

- Sucrose binds water, preventing microorganisms using it for metabolism
- Reduces the Water Activity (a_w) and slows growth
- Extends the mould-free shelf life (MFSL) of bakery products

This is the big one to resolve for sugar reduction, the role of sugar as a humectant. Sugar reduces water activity in cakes, referred to as the Equilibrium Relative Humidity (ERH), which increases MFSL. The MFSL graph shows that the higher the ERH, the lower the mould free shelf life and vice versa. The graph goes from approximately 27 days MFSL at 80% ERH to approximately 2 days MFSL at 90% ERH. Take sugar out and the water activity (ERH) rises. So a 20% reduction in sugar means the water activity goes up, not by 20%, because it's not a linear relationship but it increases, and that means that the mould free shelf-life will be lower. That really is important for cakes that need to have a long shelf-life and has to be addressed when reformulating a recipe to reduce sugar.

There are various alternatives for retarding mould development and killing mould on cakes and other bakery products.

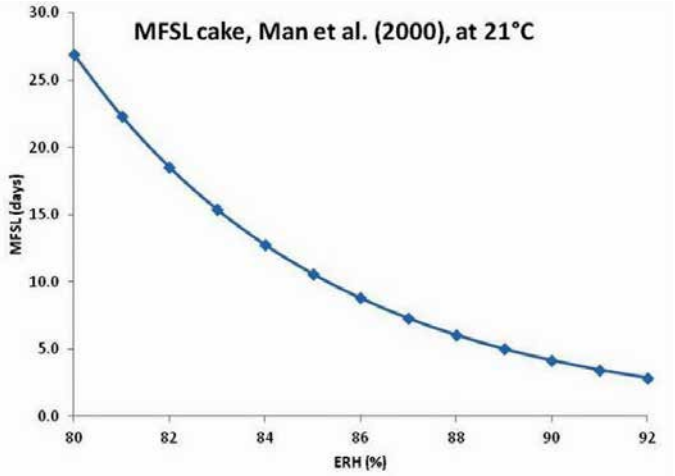
Methods of killing mould on the product surface

- Heat treatment in the pack (e.g. Heinz sponge pudding in a can, Aunt Bessies and many others in a plastic pot, some Bagels and bread)
  - Issues – product stales in the can (crumb becomes firmer)
- Surface sprays also work, as do UV and pulsed light (to some extent)

We can kill mould spores on the surface of a baked product by: heat; surface sprays; and by UV and pulsed light; since the contamination is on the surface of the product. We can also do things to slow down the development of mould on the product to give it a longer MFSL. Products like Heinz sponge puddings, baked in a can, have been around for years, and an example of a product that has had a heat treatment during baking and sealed in the can post baking to prevent contamination with mould spores. Quality wise it's not great because the puddings stale during shelf life but they are heated by the consumer prior to use and that refreshes them. There are other similar products to the above that have more cake-like structures, such as Aunt Bessie's puddings that are in plastic pots.

Slowing mould growth using different humectants

The above table shows the effectiveness of various ingredients in comparison to sucrose (sugar) for lowering the water activity of bakery products and extending their MFSL. As you can see, salt is 11 times more effective than sucrose in this respect but salt is another target for PHE, so we can't use very much salt. Fructose is also better than



sucrose as a humectant but as stated earlier, this could lead to the use of high-fructose corn syrups which have a bad reputation in America for being one of the causes of obesity. Personally I don't think this is something we want to be considering as one of the solutions to achieving the 20% sugar reduction in bakery products.

Let me look a little bit at sourdoughs or sour starters and the benefits of that. Sourdough cake again has been around for years. Some of you may have had a German Friendship Cake recipe passed on to you, which includes the use of a sour dough starter. You may have produced the starter and the cake and kept the starter going for a short time and then it has died and you don't make the cake again. However there is potential within the sourdough for extending the MFSL of cakes and other bakery products because it contains numerous antimicrobial organic compounds generated by the bacteria in the natural yeasts. They are similar to anti-mould agents we already use, such as acetic acid, propionic acid and lactic acid. The use of sourdough slows down the mould growth and extends shelf-life. However there is always a 'but' to these things and they're more effective in the low pH cake. If a cake has a neutral pH cake, then the acids in sourdough tend to be in their salt form and therefore do not act as a preservative. The low pH is required to force the organic compounds into the acid form and then they act as preservatives.

The above are a few pictures from our sour dough cake experiments using a pound cake type recipe as the control. Incidentally I like my presentations to have a start,

middle and a happy ending. However this one has a start, middle and a work-in-progress, since we haven't got the happy ending yet! The tests were based on a standard pound cake control recipe to which was added:

1) A flour and water mix with no fermentation.
2) A sour only, with no flour and water mix.
3) A flour and water mix with 1 hour fermentation.
4) A sour, plus a flour and water mix.
5) A flour and water mix with 2 hours fermentation.
6) A sour, plus a flour and water mix with 2 hours fermentation.

Structurally all the cakes were fine and we obtained lots of data on them using c-cell and texture analysis. The table below gives pH, a_w for each test.

Sample	Details	pH	a_w	MFSL
1	Flour and water, no ferment	8.05	0.86	23 days
2	Added sour, no ferment	7.40	0.86	23 days
3	Flour and water, 1hr ferment	7.98	0.87	23 days
4	Added sour, 1hr ferment	7.40	0.86	23 days
5	Flour and water, 2hr ferment	7.90	0.86	21 days
6	Added sour, 2hr ferment	7.34	0.87	26 days
Control	Standard pound cake	8.05	0.83	31days (!)

Calculated MFSL about 10 days

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Interestingly the pH hasn't gone down very much in the trials but there is scope to get that pH further down with more fermentation to improve the shelf-life. The control pound cake shows 31 days mould free shelf-life. That is mainly because the facilities in our test bakery are very clean and therefore contamination of the cake surface with mould spores is low. If you have unclean facilities in a bakery or a store room, the contamination of the cake surface can be high and this will reduce the cake's mould free shelf-life! So another way of extending product shelf-life is by having clean premises and surfaces. The addition of the sour, sample 2, did give an improvement in shelf-life against sample 1, which is really the control, with 23 days MFSL. In Sample 6 the pH has been reduced from 8.05 in Sample 1 to 7.34 in sample 6. That's not a low enough pH really for these acids to act as preservatives, so definitely the above is a work-in-progress!

In the MFSL Commercial Cakes slide quite a lot of the cakes have a low pH, usually when a preservative has been added. There isn't much point adding a preservative if you don't depress the pH, because a preservative like sorbate prefer a pH of about 5, and propionate prefers a pH of about 6. So if you have a neutral pH cake it's much better to make it slightly acidic. Christmas cake and fruit cake are examples of low pH, high acidity cakes. In terms of the eating quality these cakes are perfectly acceptable to the consumer despite being low pH. Clearly you can see that the mould free shelf-life of the Christmas cake goes up considerably when the potassium sorbate level is increased from 0.04% to 0.1%!

MFSL commercial cakes

Product Description	a_w	pH	Preservative	MFSL (days)
Marble Cake	0.728	7.35	0.19% P. Sorbate	225
Orange and Raspberry Muffin	0.673	6.04	0.20% P. Sorbate	1205
Blueberry Muffin	0.713	6.29	0.20% P. Sorbate	643
Marble Brownie - Plain	0.765	6.89	0.154% P. Sorbate + 0.174% C. Propionate	101
Marble Brownie - Chocolate	0.789	6.85	0.154% P. Sorbate + 0.174% C. Propionate	63
Marble Cake	0.798	7.57	0.10% P. Sorbate	48
Trifle Sponge Cake	0.806	7.64	0.205% P. Sorbate	45
Christmas Cake	0.811	6.22	0.04% P. Sorbate	34
Banana and Walnut Muffin	0.950	7.95		3
Chocolate and Date Muffin	0.920	7.59		4
Christmas Cake	0.787	5.39	0.10% P. Sorbate	186
Fruit Cake	0.741	5.00		84

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Sour ferment cake thoughts

- Sours and ferments lowered the pH due to acid production
- Cakes with flour + water added, or sour starter had lower shelf life due to the diluting effect on the sugar, hence higher a_w
- Sour/fermentation times were not long enough to replace the antimould effect of a higher sugar content, although 2 hours ferment time had a positive effect

Above shows potential but more work needed to reduce sugar and achieve MFSL. A sour can add some natural preservative to a cake recipe.

7. Sugar's role as texture softening agent

- Sucrose binds water within its structure, keeping products soft over shelf life
- Water is one of the best texture softening materials (fat and air are others)
- Water and air are zero calorie - but water reduces MFSL

Disadvantages of sugar replacers in cakes

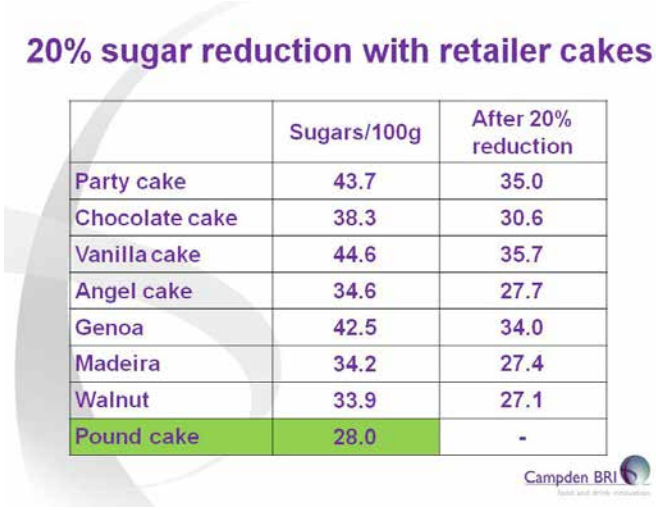
- Sugar (sucrose) is clean label
- Sugar has many functions so more than one material is required for its replacement, therefore ingredient lists get longer
- Manufacturing cost increases
- Product texture and flavour will be different
- Calorie content can increase (fat proportion increases in proportion to the sugar content decreasing)
- Inulin can 'contain' sugar as measured

The above covers some of the disadvantages of the materials that have to be used to replace sugar in cake to try to maintain cake quality and shelf life. reducing sugar in cake.

The future?

- The sugar debate has not finished yet
- Some bakery products are high in sugar and are therefore open to bad press
- Efforts are needed to reformulate existing high sugar bakery products to low sugar versions
- Retailer cakes already contain high sugar levels (for MFSL) - sweetness is not the problem
- MFSL is a major challenge - sour starters and extended fermentation are options to address MFSL

It is very important that the industry takes action to reduce sugar in bakery products. and definitely, I don't think sweetness is the problem. We can take sugar out and the flavour of that cake will be acceptable. The sugar content of the 'pound' cake is close to the sugar level we need to achieve with a 20% sugar reduction. The big challenge for the cake sector is maintaining mould free shelf life after the sugar reductions and I have given various options for this in the presentation



The table '20% sugar reduction with retailer cakes' shows a range of retailer cakes taken off the internet, with their actual sugar content and what it would be after a 20% sugar reduction. As I mentioned earlier, the current sales weighted average sugar content of cake is 34.9g per 100g of cake, which would reduce to just under 28g with a 20% sugar reduction. The products that are higher sugar than this in the table will probably be iced and are therefore naturally much higher in sugar. You do have the option of making the icing thinner to reduce the sugar. The interesting thing is the pound cake at the bottom at 28g sugar, which is what the 20% sugar reduction for high sugar cakes will end up if we can achieve it.

My final list following is again one that I added to this week to bring it up to date.

An alternative future?

- Cake has the potential to play a more important part in our diet
- It can be much healthier - lower sugar, higher fibre and the dietary benefits of extended fermentation
- It does not require such high quality wheat as bread – so cheaper and more sustainable
- Is there a need for heat treated flour?
- What shelf life is required?

As my colleagues at Campden BRI know, I am a huge fan of cakes and think that they could have a much bigger role in our diet than currently. We can make cake healthier, with reduced sugar and higher fibre. If sours and extended fermentation of some of the flour can be included in cake recipes, there is strong evidence of the dietary health benefits of the action of the bacteria and acids in the sours and fermented flour on the carbohydrates and the fibres that are naturally present in the flour.

Now I come to my really contentious points. Cake doesn't require such high quality wheat as bread, because we don't have to generate the gluten structure in the same way as bread, so it's a cheaper option of getting cereal nutrition into our diet. The wheats for cake flour tend to be higher yielding than bread wheats, so it's a more sustainable solution.

My next point dawned on me a couple of days ago when I was doing recipe calculations for the 20% sugar reduction. Most of the current long shelf-life high cakes are termed 'high ratio' cakes because they have a high level of sugar and moisture. (NB We should find a better term than 'high ratio' cake!). Heat-treated cake flour is required for the production of high ratio cakes because standard cake flour will not cope with the amount of liquid in them. So the question is, 'if the 20% sugar reduction takes us down to the pound cake sugar level, do you need heat treated flour for the new formulation'? If not, what's the future of heat-treated cake flour?

The final point of my alternative future is 'what shelf-life do we want'? We can take 20% of the sugar out of high ratio cakes without adversely affecting the taste but it will affect the mould free shelf-life. If we're prepared to have a shorter shelf-life we can make the sugar reduction now. If not what shelf-life is acceptable and how do we achieve it? So some interesting and challenging points there to consider.

Some unashamed publicity to finish! Our 2018 International Bakery Technology Conference takes place on the 23 – 24th May 2018 and I hope that many of you will attend. As part of the conference we have a dinner in the Pudding Club which is a very enjoyable evening. The menu includes 7 puddings and you will do well if you can eat seven puddings - I've only managed six! Please put the dates in your diary.

in the last ten years Thank you very much Gary. I'm not a scientist but I could understand most of that. While you're thinking of some questions to ask Gary I have the following question. I get the impression that Government does not understand why intensive sweeteners such as Stevia and others shown on your slide, cannot be used in the processing of cake product to replace lost sweetness when sugar is reduced. How closely are you liaising with the Government on this?

Gary Tucker Well, as Campden BRI we do have discussions with Government and sit on some committees that are involved with sugar reduction. We tend to work through Gordon Polson of the Federation of Bakers, which is part of the Food and Drink Federation (FDF) and Gordon regularly liaises with Government. Gordon, do you want to say something about the discussions you've had with Government?

Gordon Polson, Federation of Bakers There has been intensive discussions with Government about the challenges of reducing sugar in bakery products and I don't think they are in any doubt that they are serious challenges. Unlike salt reduction, I think the Government has been a lot more in listening mode about the various options required in trying to reduce sugar in bakery products. In other words, they haven't just gone for the simple option of just reducing sugar. They have let the industry consider: portion control; and alternative ingredients for reformulating recipes to achieve the

guidelines of a 20% sugar reduction. So they have been more in a listening mode but they are still adamant that sugar is an issue regarding obesity and sugar reduction has to be considered for bakery products.

As far as the artificial sweeteners like Stevia are concerned, that's an EU issue and in or out of the EU, it is something we may have to look at from a UK legislation point of view if the EU doesn't move on the ban on the use of artificial sweeteners in bakery products. However there are continuing lobbying discussions on the possible use of these artificial sweeteners in bakery products.

Ciaran Lynch, Carbery Group I was very interested in the data that you put up on the sourdough and the flour & water ferments. Just curious to know from the set of trials you carried out, what sort of pH targets you might have in mind for flour & water ferments and how long it might take you in the process to get to those targets.

Gary Tucker Those were our first set of trials where we were just trying to assess what impact there was on pH depression and what mould free shelf-life we were likely to get. We will now be embarking on further trials. My thoughts are we really need to be looking at a pH of between 6 and 7, probably closer to 6, but of course it depends on the flavour that we then end up with. The organic acids are more effective if we can get that pH down and that will have a positive impact on the mould free shelf-life. So I think it's really looking at about pH 6-6.5. Currently we have gone up to two hours for the flour & water ferment. I think it's a fair bet to say that we're going to need a few more hours of fermentation to get the pH down to a 6 – 7 pH target.

Sylvia Macdonald Many thanks for an excellent and wide ranging presentation Gary. *Applause*

Our next speaker, Etienne Vassiliadis, is going to tell us about a new natural cereal called Tritordeum, born from a combination of durum wheat and wild barley. I'm delighted to say that we will be able to enjoy some samples of products made with Tritordeum when we break for coffee. Tritordeum flour can be used in a wide range of breads. It is a natural crop and is not genetically modified. Etienne believes that it offers several health benefits, which he will highlight. Etienne, please tell us a little bit about yourself and Tritordeum.

The Health and Nutritional Benefits of Tritordeum, a New Cereal by Etienne Vassiliadis, Business Manager, Agrasys

Good morning everybody and first just a few words about myself. I've been involved in various positions in the food industry over the last ten years, mainly in R&D, the most relevant one being with bakery supplier CSM. I then joined Agrasys, a Spanish company dedicated to the introduction of Tritordeum worldwide. I will try to give you today a very general introduction to what is Tritordeum. To be honest, I could spend the whole day speaking about it because there are so many aspects that we could focus on but I will try to give you a very general overview.

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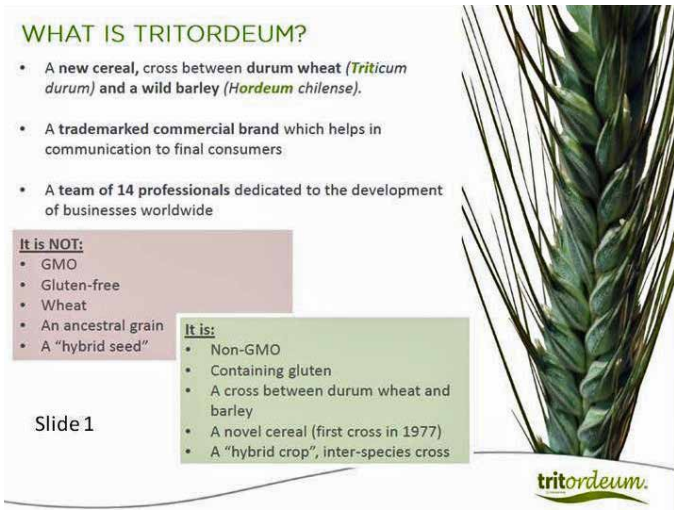
WHAT IS TRITORDEUM?

A cereal, a cross between durum wheat *(Triticum durum)* and a wild barley *(Hordeum chilense)*. It is a trademarked commercial brand, which helps in communication to final consumers. Tritordeum is grown in Spain, Italy, France and Turkey and is commercialised all over Europe. A team of 14 professionals are dedicated to the development of Tritordeum businesses worldwide.

Tritordeum is a new cereal. It's not an ancient grain, which are very popular nowadays. It's really the opposite of that because it was created 30 years ago with the idea to bring some of the agronomic characteristics of cereals like barley into durum wheat. So the idea was to bring, for example, resistance to disease in the field but without losing the good yields that we have in durum wheat. So that was the primary idea when they started on what was originally a scientific project with no commercial value. However after trials they realised they had a crop which looked good in field and that they could make bread from it.

The trademark the name of the crop is Tritordeum, which is an interspecies hybrid between durum wheat and barley. The scientists that worked on the project in the 1970s decided to create a company, Agrasys, to try to commercialise this new cereal. So they bought back the



exclusive rights of commercialisation to the research centre in Spain, and they launched it into the market in 2015. 95% of their time is dedicated to introduce the new cereal throughout Europe. We have other speciality crops as well in the pipeline but today we are focussing on Tritordeum.

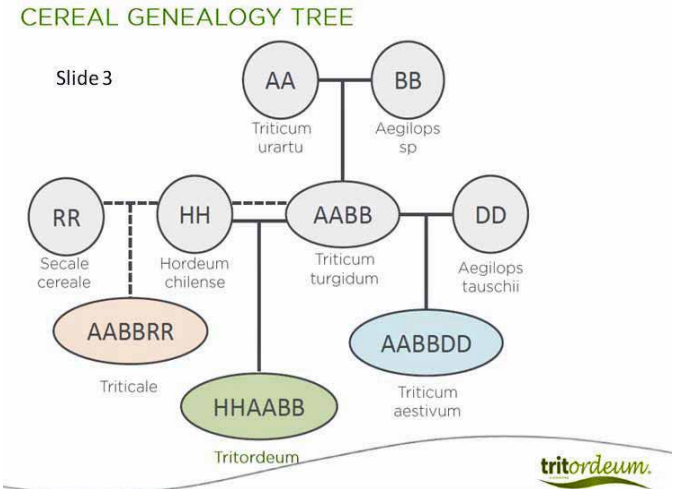
We have a team of 14 people located in Spain dedicated to that cereal. We grow it in Spain and Italy, and now we've started to grow it in the south of France and in Turkey as

well. Our idea, to be very clear, is try to introduce it here in the UK. The varieties that we have bred in Spain are not adapted to the UK weather, but we have new lines in the pipeline that we are going to test in the filed in the near future. We are already testing some new lines in France, Greece and Switzerland.

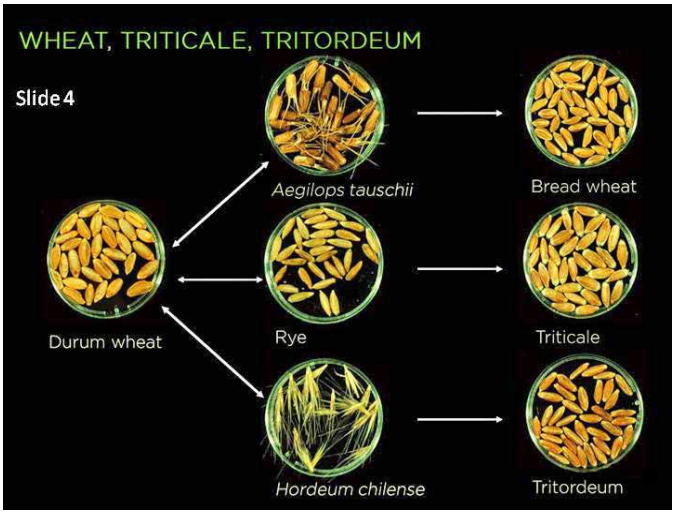
As said before, it's not a GMO. I could explain to you the techniques used but we don't have enough time, but if you want more information, I could let you know during the break or send you information.

The first cross was managed in 1977. When you want to cross two different species, it's not an easy exercise. The first cross that was managed actually between two species of cereals was in the case of Triticale, which was created 100 years ago. Triticale is a cross between durum wheat and rye in that case. The cross was allowed because of the genetic distance between those two cereals. The next cereal that is closest to durum wheat is barley, and this is why barley could be crossed with durum wheat, but not any kind of barley. The scientists had to look for the sub-variety of barley which allowed the cross. This variety they found in Chile and Argentina, so it's not a barley that is known to us in Europe. The company was created in 2006 although commercialisation started in Spain in 2015. We created a new value chain looking at existing value chains but in our model we tried to really close the circle. So we have production, we have milling of the grain to transform into flour and then we sell on the open market. Tritordeum is not a hybrid seed, it's a hybrid crop, which means that any farmer that has Tritordeum is able to keep grain from one crop and replant to get a further crop of Tritordeum. So we had to put in place a licensing system to keep control over this. We launched it in Spain and Italy first and then we moved to other markets and today, of course, we are looking at the UK to introduce Tritordeum.

The genealogy tree for cereals shows that all the cereals we eat today are hybrids. Most consumers, who tend to be afraid of the word hybrid, don't know this but durum wheat and bread wheat are hybrids. You can see that Triticale was created by crossing durum wheat with rye. In the case of Tritordeum was with this specific sub-variety *Hordeum chilense*. Our bread wheat is an hexaploid plant, which is a cross between *Triticum turgidum*, which is a durum wheat (AB genome), and an ancestral diploid cereal, *Aegilops tauschii* (D genome). There is one important point here



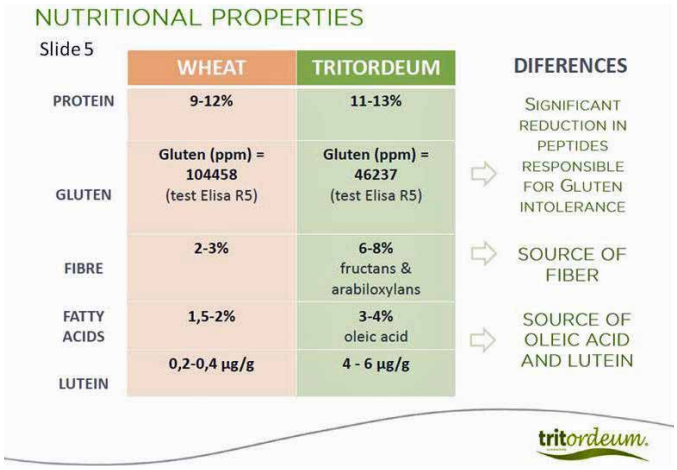
on this slide, which I will mention later. You see here the genomes that you have from the different cereals. The D genome that we find in our bread wheat is the one that is coding for the proteins of the gluten that trigger intolerance to gluten to people who are coeliacs, for instance. So in the case of Tritordeum, like in the case of Triticale or even in the case of durum wheat, we have a drastic reduction in those immunogenic peptides that we find in gluten. So this is one of the important characteristics that we will highlight later in the case of Tritordeum.



Slide 4 is a picture to give you an idea of what the grains look like from those different crosses. I have a sample of grain which I brought from Spain if you want to have a look at it later. The grain is very elongated and it's much smaller than wheat, so when you mill it you get a different result in terms of ash content, fibre content, etc. That's why the nutritional characteristics are different to a standard bread wheat. Although Tritordeum has a vitrosity which is between durum wheat and bread wheat, it behaves like a bread wheat when milled

If we look at the nutritional properties, of course it's always difficult to show data because you can ask which wheat are you looking at, are you looking at pure varieties or blends of different wheats?

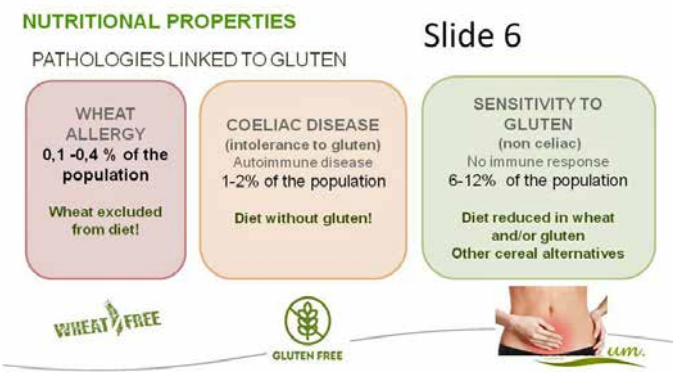
So here in this case we took a commercial wheat which is probably a blend of different varieties of wheats, but it's to give you an idea to compare Tritordeum with a standard bread wheat. We have a good content of protein actually. Today, we have two commercial varieties of Tritordeum,



which we always sell as a blend of the two varieties. Of course, it's difficult for us having only two varieties to have a standard quality all year long for all our customers, so we use those two varieties. We have several lots actually that we select but we separate by quality and we make homogeneous lots using those qualities, but of course it's much more difficult than a standard bread wheat.

An important aspect is the gluten. So it's a cereal containing gluten, so be careful, it's not a gluten-free cereal, but in the case of the gluten, if we look really at the different fractions of gluten, some gliadins are the ones causing intolerance for people with a coeliac disease. In the case of Tritordeum, we have a drastic reduction in those gliadins, and as I told you it's because we don't have the D genome in Tritordeum. We have clear evidence biochemically and later I will come back on it. We have been doing as well in the last two years, nutritional trials on humans.

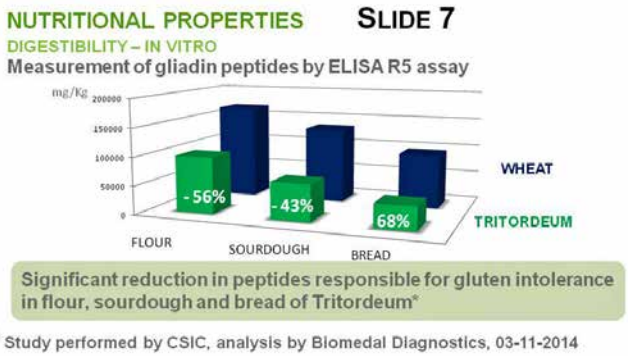
If we look at the fibre content, comparing flours milled at the same extraction (72%-74%), we have a high amount of fibre, as well as a high amount of fatty acids and this is very understandable because the shape of the grain is different, the proportion of the germ in the grain is higher, the proportion of the bran as well on the outer part of the grain is higher so we get more fibre and more fatty acids than in standard bread wheat. As well, very interesting characteristics, is the content of lutein. Lutein belongs to the family of carotenoids, it's a natural pigment that gives a very yellow colour to the flour, to the grain and to the baked goods. Tritordeum holds ten times more lutein than in a standard bread wheat.



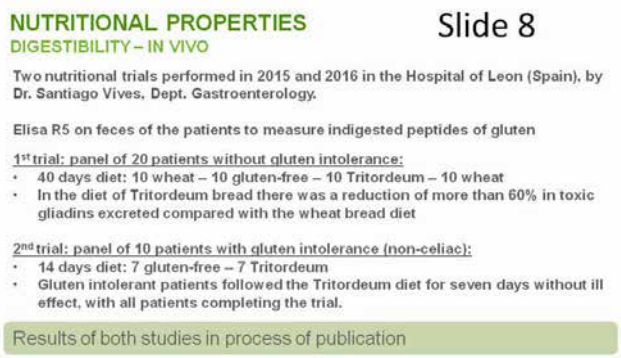
If we speak about pathologies linked to gluten with Tritordeum, I think I have nothing to teach you today on that. With Tritordeum, we are targeting any type of consumer because it's not about trying to find a solution for people that have a known gluten sensitivity. Although some of the customers of the bakers that work with Tritordeum today, that claim to have this non-celiac intolerance, say that when they eat Tritordeum they feel better or even some customers manage to restart eating bread. They left standard bread, and switched to gluten-free, and now they started again eating gluten containing bread made of Tritordeum and this was really something interesting. For this reason we are now focussing a lot our research in this area. I could let you know at the end what we are doing.

We have made a lot of tests, biochemical tests, measuring basically the amount of gluten using the method which is recognised by the *codex alimentarius*, which some of you might know. It is an ELISA R5 sandwich kit which was developed actually to detect the amount of gluten in gluten-free products. So if we use the same kit and we measure the amount of those peptides, because remember we are measuring only the presence of about ten peptides on a range of 150 peptides. Because gluten has more or less 150 peptides and we are measuring only ten of them. So when we say that a product is gluten-free, actually it doesn't mean that it doesn't contain gluten, it means that it has a very low amount of those specific peptides which are causing the intolerance. So we measure on flour, on sourdough made with the flour, and on bread combining the sourdough and the flour.

What's interesting to see is that there is a synergistic effect in the reduction of those peptides causing intolerance; you see a drastic reduction of about 70%. There are several reasons for this but again I cannot enter into details today.



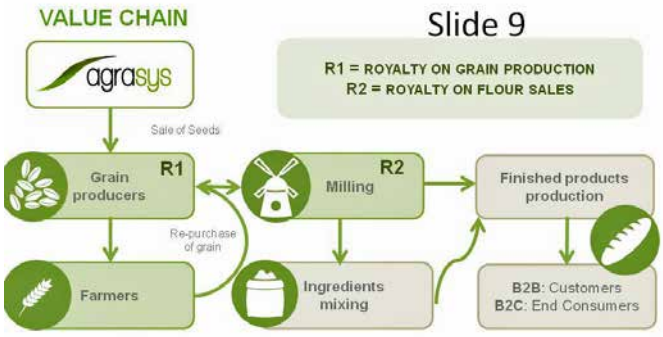
We have made two in vivo tests, one in 2015 and one in 2016. Actually we are right now publishing the first test so I cannot show you clear results today because it is not yet published, but what we have done, with the collaboration of a hospital in León in Spain that specialises in gluten intolerances and that has panels of people that are normal



people, people that are intolerant, non-coeliac people and coeliac people. The coeliacs we don't look at them because we cannot give Tritordeum to eat, obviously.

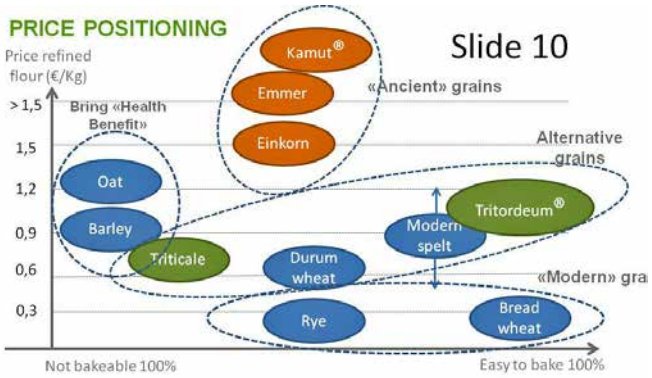
We first made the test on the normal people, but those normal people have one member of their family that is a celiac. So they are used, already, to have in their diet bread containing gluten and bread without gluten, so it's important for them to have this habit. We gave them a 40 day diet starting with the bread made with wheat, then a gluten-free diet, then a diet with Tritordeum and then coming back to wheat. We measured the amount of immunogenic peptides with the ELISA R5 kit, in their faeces, which are collected every day, and we measured the amount of indigestible peptides and we observed a drastic reduction. I cannot show you the graph yet because I cannot present all the results, but what we observed, biochemically, really was clear as well in the physiology, in the measurements that we have done in this test.

From this first trial, we were then showing that people can eat Tritordeum, there is no problem, obviously. It is already commercialised and there is no issue in that, but it was important to start with this first test to then move to the second trial where we give actually Tritordeum bread to people that are sensitive to gluten but non-coeliac. They have the same symptoms as celiacs and this is something that is measurable, even though there is no immunogenic response, but they have very severe symptoms when they eat gluten containing products. Out of this second trial, it was really interesting. In this second trial we have a diet based on ten days without gluten and then ten days with Tritordeum. All the patients could finish the test, which is already promising, and we observed as well looking how the consumption of Tritordeum could affect the gut microflora. We have some very interesting results, contrasting as well with bread wheat, and gluten-free, where the microflora is different from someone eating Tritordeum. So all these results hopefully are going to be published in the coming months.



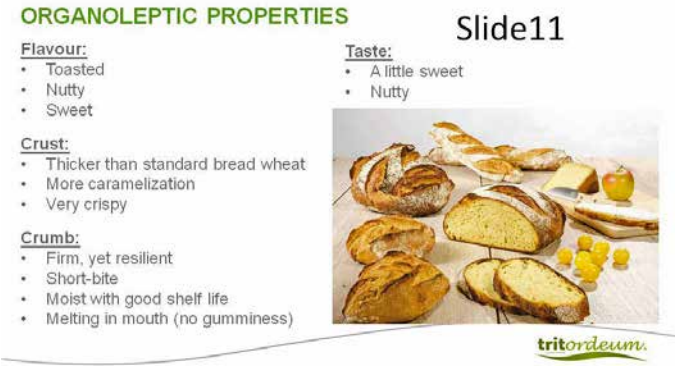
Jumping from nutritional aspects to the value chain. What we do in Agrasys is mounting value chains to sell our cereal. What we do is that we have a licencing system with grain producers and with millers in order to keep control over the crop, to keep full traceability, because we can really trace from the seed all the way to the flour. The licence is nothing more than a contract that will guarantee the repurchasing of 100% of the production, that will guarantee a fixed price for the millers, and I think we are the only cereal on the market with a fixed price all the year round on our crop. We as well guarantee a fixed price of flour to the bakers.

We have a contract with the miller that defines at which price they buy the grain and at which price they sell the flours. Obviously it's not allowed to set prices in the market but we give indicative prices to millers that follow this guideline and avoid unnecessary competition. We actually try to create a group of millers and producers to promote the cereal altogether, so we try to avoid a bit the competitive system that exists in other crops. Then the millers can sell the flour to any consumer, any customer; the customer will not need a licence to make a product made of Tritordeum.



If we try to position Tritordeum compared to other cereals, of course this is one way to see it but it could be done in many other ways. What I tried to do here is to position looking at the price of the flour, of a typical refined flour, so here prices are Euros not in pounds per kilo, and as well I put on the other axis how easy it is to bake this flour, 100%. Because one nice characteristic of Tritordeum is that it can be baked 100%. You don't need to mix it with other cereals to get a fairly good bread or a fairly good product.

So Tritordeum is more expensive than bread wheat because for the price of bread wheat, you can buy bread wheat, and with all the technology behind and the value chain that we are mounting, our cereal is more expensive. As well the yields are lower than standard wheat, so all these factors explain the price, but we try to position ourselves in the range of spelt. In the case of spelt, prices are very volatile, as you might have known in the last years, and with Tritordeum we are trying actually to avoid this volatility. We are trying to avoid a lack of stock, for example, like in the case of Kamut, where people had a lot of products with the availability of grain, and we try to be at a price which allows artisans as well as industrials to start working with this crop.



I think for me this is the most important point of all because you can have the best product in the world and if it doesn't

taste good, if it doesn't look good, you won't sell it. I think this is where we really have a unique selling proposition that our product tastes and looks different. Do you need Tritordeum in your diet? No. Do you need spelt in your diet? Absolutely not, but today consumers like to have variety in their diet, and they are consuming not only wheat but other crops, other cereals and other seeds. I think all the launches that have been done in our industry in the last years are showing that people like to try new things. I think we have the only new cereal in the market for a very long time. So for me it is really a breakthrough innovation as well. I like this product because we have something that nobody else has, and it can offer really a wide range of products. Anything you can imagine to do with wheat, you can do it with Tritordeum as well. It behaves really well in baking; it has a very yellow colour; the crumb texture as well is different because the gluten structure is different, so we have a very short bite crumb structure. We have a slightly sweet taste because we have more free sugars in Tritordeum and we have a bit more caramelisation of the crust.

So it's different, but it's not so different that some consumers would not like it. But I will let you be the judge of that by trying the products later.

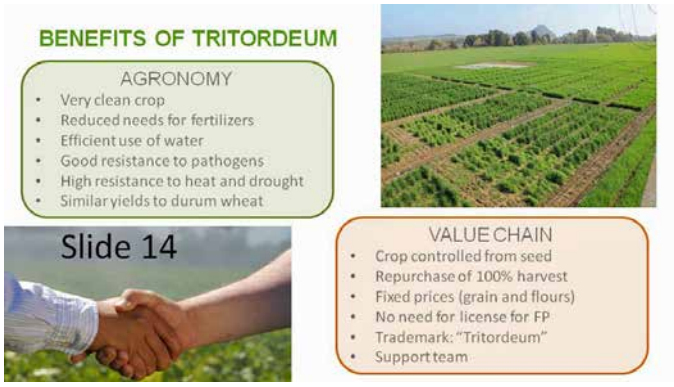
What we did really in the last couple of years is not only producing flours, because with flours you can do many things, but we are trying to diversify a bit the range of products that we have. So we worked on flakes, we worked on sourdoughs, we worked on toasted flours, we worked on pre-gelatinized flours. We have a lot of different projects involving different companies in Europe to develop a wide range of ingredients. The main application today is bread but we have as well other applications, for instance beer: we can malt the grain of Tritordeum and we can make beer out of it. We can produce, due to the vitrosity of the grain, fine semolina to make pasta. For instance, our Italian partners are selling Tritordeum mainly in pasta, in pizza making and in beer. So we are looking always for new applications.

In terms of declaration, it's very important to declare the presence of gluten because today many consumers don't know what Tritordeum is. So when they see the declaration Tritordeum, someone that is coeliac might not know that it contains gluten, so it's meant that we have to put gluten. We asked FSA and they recommend to explain what Tritordeum is. You are not obliged to do it but they recommend it and we usually recommend it as well to our customers.

In terms of nutritional claims, if we look strictly at the flour base, we have a source of fibre, we are above the 3g per 100g of fibre but again if you want to have a clear claim on your finished products, you have to look at the nutritional values of the finished products.

What we cannot say, FSA does not allow any claim, is that Tritordeum holds a more digestible gluten; today it is either with gluten or without gluten. I think they even removed recently the reduced gluten or low in gluten. There are no possible claims associated to gluten. There are no exact claims allowing us to say that it is more digestible. That's why today we have a clear difference between our scientific communication, because we have evidence that shows that Tritordeum might be more digestible, and the marketing communication, where we have to recommend to our customers not to say these kinds of things on packaged goods.

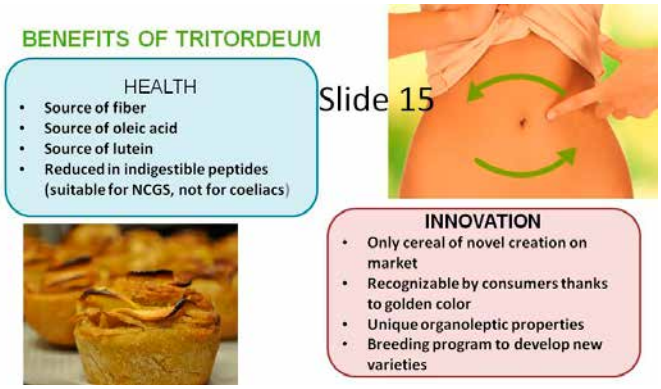
Also it's a shame about the lutein. Lutein is one of the most sold food complement in the US because there are many studies showing that lutein has a positive effect on our eyesight, because it's protecting our macula from the degeneration occurring from the sun's rays. So there are a lot of studies, a lot of dossiers already in the hands of FSA, but there is no claim allowed today on lutein. Maybe it will come but today we cannot say anything about lutein.



To make a summary, I didn't speak so much about the agronomy, there is a lot of things to say actually on that part. What we see is that it's a very clean crop, it's a very robust crop, so we don't need so much fertiliser in conventional farming and it's really adapted to organic farming actually. To give you an idea, we have today 50% of our production which is conventional and 50% organic. Last year we had only 10% of organic, so the organic is really growing a lot in Europe and the demand for organic Tritordeum even more. We have very good resistance. It's not a "Ferrari" in terms of yield but it behaves very constantly every year, and actually farmers are looking for these good results every year; they're not necessarily looking for the best crops in terms of yields.

Our value chain I would say is quite unique. We have full control from the seed all the way to the flour. We have fair pricing for everyone and this was really the base in order to start such a project, because there was no demand for Tritordeum in the market so we had to convince everyone to go for it, so we set very fair prices for all the actors. We have a trademark. We are, I think, the only cereal with a team behind really supporting the promotion of Tritordeum.

In terms of health, we can speak about the fibre, the folic acid, the lutein and the gluten, but again I think all aspects



might be interesting for part of the consumers but it's not our aim today to have a health claim. Actually, as you have seen, they are taking out most of the health claims, there are very few left, and it's not our aim to have any studies to get a health claim, but we have clear evidence showing that Tritordeum might be suitable for people with non-coeliac gluten sensitivity. I think it's a very innovative product and hopefully some of you will be interested to give it a try and make an opinion for yourself. Thank you for your time.

Sylvia MacDonald, Session Chair Etienne, thank you very much indeed. Before we go through for our break and samples, do you have any questions for him?

Andy Clegg, Morrisons Very interesting to hear about this new variety of cereal. We have done a lot of work in our stores expanding our gluten-free range over the last two years. How could bread products made with Tritordeum be marketed to our customers because they will understand or recognise that brand name? What selling points could be used to promote the Tritordeum bread?

Etienne Vassiliadis You can tell customers that it was technologists who created the name and not the marketing department. They took 'trit' and 'ordeum' from the Latin names 'triticum' and 'ordeum'. Today most of our customers use the brand name Tritordeum. Everyone says first that that's a horrible name, it will never sell, people will not like it, but experience has shown that consumers get used to the name and remember it because it is a strange name!

In terms of marketing the popular selling point is that Tritordeum is a new cereal which is not wheat. The fibre content of Tritordeum is also used as a selling point.

We started our first marketing campaign in Spain two weeks ago in which we describe Tritordeum as 'More Than a Cereal' and we supply information on all the important aspects of Tritordeum, such as its origin; traceability with the miller; innovation with new bakery products for the market; flavour; and information on nutritional aspects of Tritordeum. If you are asking if you can make any particular nutritional or health claims for Tritordeum the answer is no. Really what our customers use today is the fact that it's a new cereal and it allows innovation for new products. I hope that answers your question?

Andy Clegg I think customers will still struggle with that brand name!

Etienne Vassiliadis Everyone says that but experience has shown that they get used to it. We have customers that have created a brand name for products produced from Tritordeum.

Sylvia MacDonald Have you had any reaction to the crumb colour of bread made with Tritordeum?

Etienne Vassiliadis Usually they are good reactions. Some customers say it's too yellow, especially in the north of Europe, I would say consumers are not used to seeing this yellow colour. In Spain and Italy for example, where there is a lot of consumption of durum wheat, the colour is not an issue, and in the south of France as well. Customers in Scandinavian countries, where they are not used to yellow coloured bread products, love it because it looks and taste different.

Linda, Chopin Technology, France Do you know what your market share is in Spain and Italy?

Etienne Vassiliadis I cannot give you clear numbers for our market share. Each year we cultivate around 1,500 hectares of Tritordeum. Today cultivation is fully in-line with the sales, because, as I said in our model, we are re-purchasing the total harvest.

We have yields of between 3-6 tonnes per hectare for Tritordeum. We have the best yields in the north of Italy of up to 6 tonnes per and in Spain we are between 3 and 4 tonnes per hectare. For organic Tritordeum we have yields which are much smaller at between 1 - 2.5 tonnes per hectare. So yields are lower than standard bread wheat but really the main difficulty is the commercial one because growing is not a bottle-neck.

Sylvia Macdonald Many thanks for such an excellent paper Etienne. *Applause.*

Our next speaker has bakery coursing through his veins and has done since an early age, helping his mother with baking. His knowledge, his ability and his time spent in the trade has earned him respect throughout the industry. If you go into Morrisons supermarket and see their range of bread and cakes and their scratch baking, you will see that it's driven by a passionate team and very knowledgeable Senior Buying Manager of bread and instore bakery, Andy Clegg. Andy and Morrisons hold the prestigious title of Instore Bakery Retailer of the Year, one of the Baking Industry Awards which, as you know, is organised by British Baker. It is a tremendous accolade and here to tell us how it was won and what Morrisons are looking for from those who supply them is Andy Clegg.

How Morrisons Won BIA Instore Bakery Retailer of the Year by Andy Clegg, Category Manager, Bakery, Morrisons

Good morning. It's a real privilege to come and talk today about something that I have a passionate belief in and something that we work really hard to achieve every year, which is the Instore Bakery Retailer of the Year award. We're very proud to have won it last year. I don't get out as often as I should, so it's a real opportunity to get away from the usual visits from Head Office to bakeries, supplier sites and competitor stores, and to tell you about

how and why we won such a prestigious award. Before I start, I'd like to give a quick introduction about myself and also a bit of context about Morrisons' bakeries, because I'm conscious that not everybody in the audience knows who I am.

I've been with Morrisons for 23 years now, so started when I was six! For 21 of those years I've been involved in various roles within bakery as a buyer and as a senior manager. I started baking out of interest, as Sylvia said, when I was this high with my mum. We used to bake in the kitchen using a washing-up bowl as a mixing bowl. We'd make cobs together and my prover was the airing cupboard, where we would put a wet tea towel over the dough and leave it to rise and.

My commercial baking career began with Don Millers Hot Bread Kitchens - I don't know if anyone will remember them back in the 1970s to the1990s? I then joined Morrisons and my career really advanced when I became buyer for instore bakery, cake shops and plant bread. I went through Morrison's apprenticeship scheme and like most of our apprentices do, I spent time at Tameside College and in the instore bakeries. I was last working instore before Easter, making hot cross buns, 2,000 of them and if anyone wants to see them I have a photo on my phone - I'm really proud of them.

When I started at Morrisons we had 55 shops and 49 bakeries and today we have 450, so you can tell that we're a sizeable operation. I buy over 130,000 tonnes of wheat a year to supply our bakery manufacturing and instore bakery operations. We over-trade in this area with a 17% market share versus a grocery market share of about 13%. We also have 374 dedicated cake shops in which 50% of the products are made from components instore and creamed. There is a lot of skill in producing cream cakes fresh every day. This area is in tremendous growth and customers are really buying into affordable treats made fresh every day, and I'll extrapolate more on that later.

We currently have 1,200 trained bakers in the organisation and in the last 20 years, over 1,460 apprentices, trained to NVQ Level 2 in dough production and baking, have gone through our training scheme. We have always been very keen on is investing in colleague training. To maintain the level of skill and passion we need in our bakeries it is important that we invest in the training of our colleagues.

We also have an industrial plant bakery, Rathbones in Wakefield, which we bought out of administration in 2005. We bought three sites and now have one super bakery in Wakefield that has two bread plants. We have a combined production capacity for about 16,000 800g loaves an hour. We have a roll plant, a muffin plant and a third bread plant which produces French sticks and various types of rolls for our instore bakeries. Many of you will know that we had a devastating fire in July last year and I'm pleased to report that the rebuilding work has begun and we will be back in production of our new areas of product development by January-March next year. It's testament to the team at Rathbones that after the fire, we were back up and running with bread production within 72 hours, which was a real achievement and a real sense of teamwork.

We have an experienced team who are passionate about bakery. Between myself, our buyer Andy Clarke, and Martin Clayton, we have around 75 years of bakery experience with Morrisons between us. With that passion and experience there comes an understanding about what works well for stores and what stores are going to get behind particular products and find them easier to produce.

When I looked at the question of how we won the BIA, I found that the answer was not how but why? For me the BIA award was a by-product of what we are doing instore for our customers every day based on a strategy that started at the very top of Morrisons and went down to the shop floor.

Food Makers & Shopkeepers We are not just retail, we are also a manufacturing operation. Not many people know this but we are the second biggest food manufacturer in the UK. Not only do we have our Rathbones' bakery operations, we also have: our own abattoirs; our own fish processing plant in Grimsby; our own flower bouquet assembly plant in Derby; and our own produce packing houses. Being manufacturers gives us understanding of: commodities, manufacturing processes; manufacturing cost; and it makes us specialists in our own respective areas. With that specialism comes an understanding of products and customers.

'Morrisons Makes It' and 'We Make Morrisons' really underpins the above comment on Morrisons being food makers and shopkeepers. For the instore bakeries it is about scratch production and the colleagues who produce the products from scratch. When I come to talk about the corporate plan bakery 'Morrisons Makes It' becomes really relevant and important. It's a key factor, I believe, in why we won the award this year, because it's something that the judges saw from the corporate plan that was being executed really well instore.

We make and provide quality food that is affordable for our customers. Our business was built by Ken Morrison on three important factors - quality, value and service, and those three are as important today as they were 50/60 years ago in selling products to customers.

Pride Every day our bakers just want to make the best products they can, and that goes with **passion**, which we have got buckets of throughout our store estate. I was in Harrogate a few weeks back for our supplier conference and Group Commercial Director Darren Blackhurst talked about a store visit he did over Christmas. One of the cake shop girls had made a salted caramel dessert that Darren said was a thing of beauty. The girl who made it was so proud of her dessert that she almost didn't want to sell it to just anybody! She wanted to sell it to a customer who could appreciate the skill and the passion that had gone into producing it. So we have lots of skill and passion in Morrisons' bakeries.

Listening We're an organisation that listens. We listen to customers regularly through focus groups; forums;

surveys that we have at Head Office; through forums where colleagues can share ideas; and we listen to suppliers as well.

Customer, Colleagues and Suppliers, our key stakeholders. A lot of good NPD ideas and product launches come from our meetings with our suppliers and the innovation that suppliers bring to our table.

Video Our passion come to life in the following short video which simultaneously shows the production of hot cross buns in one of our instore bakeries and in Rathbones plant bakery. *Video played - applause*

So whether it's making hot cross buns instore, or in our central plant bakery and shipping out to stores, everybody has a pride and a passion in making the best product that we can on a daily basis. To put it into context, we sold seven million buns in Easter week alone, 2,000 of which I made myself of course!

BIA Instore Bakery Retailer of the Year Award So there we are in slide 1, proud winners. I chose this slide because I wanted to show that it's not just about the awards night itself. It's very nice to go down to London for the awards. It's a great evening, well presented and it's always great to win the award. You can see that the poster boy there in the top left and middle pictures is looking very pleased with himself but also look what it means to the teams in the stores in the other pictures. Left is the team at Warrington and right is the team at Scarborough, which were two of our nominated stores. I was really pleased to take two of our colleagues from our instores bakeries down to the awards night because they rarely get the chance of getting out of the instore bakery environment. We were treated to a full evening of entertainment and enjoyed the whole concept of what it means to win this award.

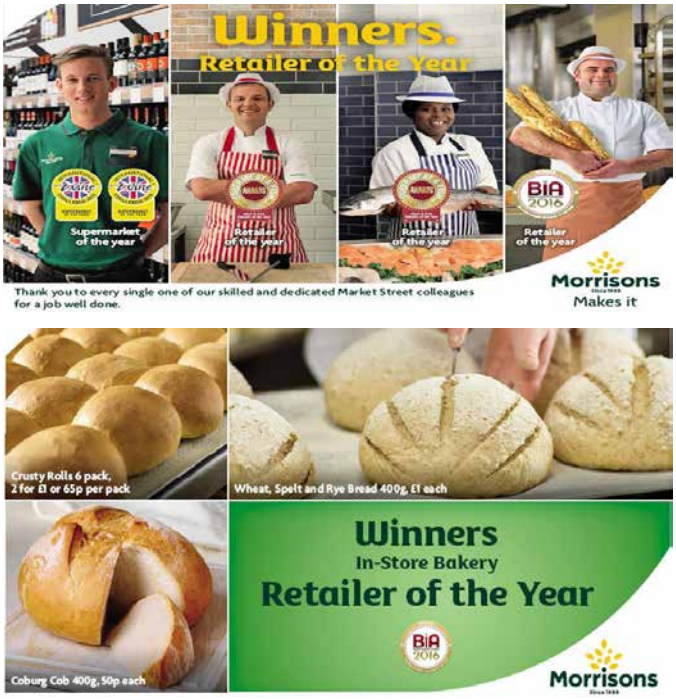
I believe it is a fantastic award to win and we're really proud to win it. It's not an easy award to win and it takes a lot of work and planning. The awards are in September each year and we started planning our entry in January and February. It's a very thorough judging process and the judges are industry experts. We prepare a detailed Head Office submission, which is based on answering detailed questions on marketing; company strategy; NPD plans; and staff training. The judges read through our submissions and visit our stores to see how they are applied in practice in the instore bakeries. We host an escorted judges' visit and last year we took them to the seaside at Scarborough. On top of that there are unannounced visits to stores as well and this is where the Award can be won or lost. This is the really tough bit because you expect escorted visits to be absolutely perfect but unannounced visits are the true test of what you are saying to the judges in your submission being executed within the store itself.

No pressure then! We have won under various guises of the award: in 2009 with our Cleethorpes' store; in 2011 with our Canterbury store; and we won it in 2013 and 2016. So we have got a really good track record in this competition and that comes with a lot of expectation. Every year we go into the competition with the mindset that we are going to win this award and, to be honest, we're absolutely gutted if we don't!

Awards are also really important to the business and we have won a tranche of awards this year, see slide 4a: meat; fish; bakery; produce; wine; - the list goes on. Awards really resonate well with customers and they underpin and give a seal of approval to the work that we do instore.

Naturally, we have been telling customers about the Instore Bakery Retailer of the Year award win. What was really pleasing is this year is that the marketing team were on to it from literally days after the award win with a range of media activities. Slide 2 is the title scene of our national television advertisement, which features giant cookies which can have customer's names on them being produced in a Morrisons' cake shop, with a little vignette at the end on our Instore Bakery Retailer of the Year award. Then instore we bring that through with posters, front-of-store banners which go out in the car park, on the side of the store, shelf markers and also on the bakery bulkheads around the department, so we have got the logo prominent. Also really important for what I said earlier about Morrisons Makes It, as you can see, there are no baked finished product on there. It's all about the skill and the scratch production.

Slides 4a and 4b Media Support Press



It went in the press as well, so half page adverts in slides 4a & 4b. Also digital as well, so facebook/tweets, Slide 5, with lots of likes on it - all this modern young people stuff.

So what did make 2016 a winning year? Well, to start with, we had a simple corporate plan committed to making the core supermarket strong again. The plan was drilled down into all areas of the business and came alive in bakery with 'Morrisons Makes It' and that's different to what we had previously. We listened to the feedback from judges from the previous year and not only did we listen, we responded and took action.

We didn't forget the importance of our unique patisserie operation. Sometimes it gets overshadowed. The bakery is such a massive operation that it's almost like a second-class area, but it's really important because not every retailer has one and not many do it as well as we do. So we made a point of saying 'this year we're going to put as much effort into patisserie as we do into bread and bakery'.

We focussed on the importance of colleague engagement and training and that's because we wanted to improve the experience that the judges had with the unannounced visits. We wanted the judges to see that when they went into stores unannounced, they would get the same experience and the same quality of product that they saw when we escorted them around the bakery in the Scarborough store.

We maintain a supplier base with long-term relationships, and that's really important. I'll come on to supplier relationships at the end of the presentation, but when you have that relationship with suppliers, suppliers can help you. They can offer technical advice, they can bring new products and innovation and they can tell you, honestly, where they think you can improve, stop-start-go, and really important we have got a number of long-term relationships and we feel it's really important to listen and to utilise that resource. Out of that are three things - the plan, colleagues and suppliers and it all came alive with 'Morrisons Makes It'.

Slide 7 A simple cohesive plan from top floor to shop floor…….

So we have six priorities, which are really the pillars of the business and we work within these pillars every day. Our six priorities are to be more competitive, to serve customers better, to find other solutions, to develop popular and useful services, to simplify and speed-up and to make the core supermarket strong again. We really focus in bakery in being competitive, in serving customers better, simplifying because when it's simple, bakers will resonate with it, they'll enjoy making it and they'll sell more, and we wanted to make the core supermarket strong again.

Slide 8 Morrisons Makes It - telling customers about our craft skills

Within that there's five ways of working. We put customers first, teamwork, we have a plan, which is within the six priorities, but we have the freedom to make decisions within that, so it's not constricting. As long as you're working within those priorities, you've got the freedom within your own bakery to react and tweak to your local market. We listen hard and we respond, we are an organisation that is committed to listening, to listening to customers, listening to suppliers, listening to colleagues, and we sell and stock. We don't stock, we sell and stock, so everything that we buy we want to sell. Ken Morrison, sadly no longer with us, said well bought is twice sold and it is true, because if you buy well, then you won't have a problem with that repeat sale. Customers will come and buy it and you will grow volume.

Our shareholder ambitions (from corporate plan)
Focus on the core
Recover then grow
Build a stronger balance sheet
Create shareholder value

From the corporate plan came 'Morrisons Makes It', telling customers about our scratch production. 65% of what we produce in our instore bakeries is produced from flour and water and other scratch ingredients. The rest is a mixture of more complex products that we bake off. So it's a focus on craft skill and it's different to 'Made by Morrisons' which we used previously which focussed on the finished product, the baked goods. We just thought 'Made by Morrisons' was good but didn't tell the whole story and focus on the skill that goes into making products from scratch. So Morrisons Makes It is subtly different because it doesn't focus on what we have made, it focuses on the process of making it.

We have got a couple of hero lines that we picked up, so the Coburg Cob, a relatively obscure product, 400g moulded cob, cross-cut, floured, that's now one of our top 50 best sellers. Doughnuts, I think David Potts in his first trading statement he said that our revival was about doughnuts. We took doughnuts and we said, we make these from scratch and we make them really well, so let's shout about it. The whole process started with this hero product of let's take a product like a doughnut that we have done for years but just let's shout about the fact that we make this from scratch. We fry it fresh every day, we fill it, we finish it and hand dust it with sugar and we pack them off ourselves. We sell half a million a week so let's tell customers about that.

As you can see, slide 9, again no finished product, this is all about hand finishing and scratch production. So scratch produced, really difficult to get across to customers. I don't think customers understand sometimes what is scratch unless they see it, so you've got to see it to understand it, but with scratch comes quality. So customers see a product being produced and they know it's good quality because it's made there and then, and also they know it's going to be fresh because that is going straight into the oven and is going to be wrapped and sold to them that day.

We have got a lot of unique lines within Morrisons Makes It Coburg is one of them but focaccia is another one. It's unique because we make it from scratch, we don't buy in a frozen product, we make it from a mix. We make it in a big tray and then we cut it by hand and pack it off, and again offer a really good price for it as well.

Stollen and panettone - we are still the only retailers who make these from scratch in our instore bakery. We could never sell Stollen when it was a bought in cake product. I think the German product is quite dry. I was lying on my sofa one night watching the Hairy Bikers and they were making Stollen in Manchester at the Christmas market. You know when you have a light-bulb moment. I thought, yes we could make Stollen. It's no different to hot cross buns, you're making a fruited dough, the marzipan is similar to the crossing mix, and fold it over and we can do a genuine Yorkshire Stollen! We sold nearly 400,000 last year, which just knocked everything that we did before into a cocked hat because we were doing something different. The Stollen we make are soft and tasty and this resonated with customers. The same with panettone, we worked with ingredient suppliers and developed it over a number of months to come up with a unique scratch produced panettone for our instore bakery.

Things like Festival Gateau; that's been going since the year dot. You'll know it as the Green Bomb, the people who visit our stores, but it came from the Manchester Festival and it's basically a sponge cake with crème patisserie, cream and a green marzipan disc. It's almost like a talisman for the cake shop and we would never lose it because it's part of our DNA in the cake shop.

Again we have talked about it and communicated it to our customers. So within none of this instore POS is there really anything about a finished product or a finished price. There is one for the choux ring, slide 9, but it's all about the production of Coburgs, the dusting of the doughnuts, it's about the pinning of the finger rolls. Then we have gone one step further as well, so we have broken it down into regions because we know regional products are very important. So in Scotland we have Scotch morning rolls, in the south we focus on crusty rolls rather than soft. So it becomes personal to the customers and the bakers in those stores throughout the country.

As I said earlier, it's important that we focus on the training of our colleagues. Without that level of training, we wouldn't have had the level of skill that the judges saw in the unannounced visits. It meant that a young graduate trainee could show two judges round with conviction and knowledge, without the aid of a manager. So it was really pleasing that this has flooded through to the shop floor.

During the last 20 years we have successfully trained in excess of 1,460 bakers to NVQ Level 2. We're going through a bit of a change with the apprenticeship system at the moment, so we will be moving to the new Government backed Trailblazer scheme, which will be Level 2 in instore, and industrial for the Rathbones area of the business. It's got a wider syllabus than dough production, so will include things like fried products and doughnuts. As I said, we have invested heavily in doughnuts. We have just put in another 165 new Aztec doughnut fryers into our estate, which was a sizeable investment but one we felt was important to make sure that we got the right quality for what is one of our hero products. At present, we have over 100 apprentices on the training programme, 53 of them are 75% through the course and there are 50 who started in September of last year. We currently use Glasgow City College, Sheffield College and Barking & Dagenham college.

We also run a large craft competition every year and some of the suppliers in the audience get involved and help us with the competition, for which we thank you. This is a competition we run at Head Office, where we invite the best of the best apprentices to come in and carry out a set of tasks related to products in all areas of Morrisons' Market Street – there is a competition for fishmongers, one for cheesemongers, one for butchers, and one for bakers. For the bakery competition we will set the apprentice the task of making a basic product, and another task that allows them to show some kind of innovation, and subsequently some of that innovation will make it on to the shop floor.

One year an entrant made a tortoise out of rolls he put together and cut on top with a football design cutter that we had from the World Cup and he used two raisins for the eyes. It looked very good so we put it into store for sale to customers. So it's a great opportunity for stores and they get really involved with it and the competition is very hotly contested. This year it was won by one of our bakers at Rathbones, so it's open to the manufacturing bakers as well as the instore bakers. The Rathbones staff were really pleased that the plant boys had got one over on the instore boys. There's a bit of rivalry there but it was good and it promotes skill and passion. When you walk round all the competitors, the participants, they're all really proud and they're all really revved up for producing the best quality product they can.

As I said earlier, having long-term partnerships with our supplier base is really important. I believe the Instore Baker of the Year win was partly down to the fact that we have long-term relationships with suppliers who we can listen to, can have an open honest dialogue with, who can tell us where we need to develop. We value their opinions.

These are just a few of our key suppliers. We have had relationships with some of them for in excess of 20 years. With Joe Wood of Country Style Foods Ltd, it must be 30 years plus now. When I first started buying from Country

Style they were selling one Danish pastry line into us and since then we have built their business with lots of different kinds of breads and it's a multi-million pound account. It's really important factor in being food makers and shopkeepers. We value the supplier relationships. They're one of our four ambitions as I said earlier. We are a volume driven business and we want to talk to people who want to drive volume, and we listen and we help each other.

One thing I've learnt and admired in the 20-odd years I've been in this industry is that when there's a problem everybody digs in to help each other out. Obviously there is a competitive nature between suppliers and retailers, but when it comes to the crunch, we will help each other out. There is camaraderie amongst bakers and the bakery fraternity, which means that when the chips are down, everybody will go out to help somebody else to make sure they get that loaf, crumpet, or whatever to their customer.

We do have to make tough decisions at times and many of you will have been be on the receiving end of some tough decisions, but we always trade with honesty, integrity and respect. We value true innovation, unique products and newness, because we want to have that point of difference in the product we offer our customers. So how can suppliers help us to improve our offer going forward and how can they help us shape what, hopefully, will be another winning year sometime in the future?

Quality Without doubt we always look for quality since we are highly focussed on quality as an organisation. At the moment, we have got a big quality agenda. We're investing in quality. We want to notch up the quality but not the price.

Consistency We want consistency of quality – it is no good having a great product one day and not so great the next day. So if we have got a specification for a product we need to maintain that specification for every delivery.

Value If it is value for money you won't have any problems selling the product because customers will buy it.

Newness and innovation I welcome newness. I invite any supplier in the audience to make contact if you have something new and exciting you feel we could do justice to; we would like to be the first to market. Come and talk to us about it.

Great service The means all areas of the business - technical, sales, logistics, and accounts. They all have to have a great service. It means we're not fire fighting or talking about supply, invoicing or other issues. We are just focussing on the trading between our companies. That's it from me. Thank you for inviting me today and thank you for listening.

Sylvia MacDonald, Session Chair Thank you Andy, very informative and entertaining. You and I go back quite a few years. On many occasions when I phone one of the other supermarkets to speak to a known bakery department buyer contact I find that he or she has been moved to another department, perhaps now buying toothpaste, dog food, or whatever. You have always been in bakery and that's a tribute to Morrisons because they keep the people with the knowledge in the trade that they

really know and they love. Your passion for bakery came through in your presentation.

Andy Clegg I do get asked the question from time to time "why have you been in the bakery category for so long? My reply is very simple 1) I love baking and I love the category and 2) I love the industry as well. I wouldn't want to work anywhere else. People in Morrisons have always know me as the bread man, and what I like about Morrisons is they have always been keen to keep buyers in roles longer to develop a specialist knowledge of the category, and it is not just in bakery. If you think of areas like meat, for instance, you can't be buying meat paste one minute and then move into buying red meat the next minute, because there is a specialism within meat, especially when you manufacture as well, that takes time to develop. Think of carcass balance and working out where you sell your by-products to, it's a really specialised area.

So Morrisons are very good at developing and getting buyers into a specialist role. I think a lot of the suppliers in the room will agree that it means that you can develop a relationship with a trader, but also that the trader will have that element of knowledge that will earn him the respect, and it means you can have informed and grown-up discussions when you're talking about around costs, or around product specifications, etc.

Question We all really enjoyed the video you played showing, on the one hand, the plant manufacturer of your hot cross buns and, on the other hand, the instore manufacture, with your instore colleague proudly showing a pack of the Hot Cross buns he helped produce at the end. Can you tell us a little bit about how you see the interplay between the two areas of supply developing over the coming years?

Andy Clegg I think with Rathbones it's there as an asset. Foremost it's a plant bakery that produces plant bakery products, but what we will do with our own manufacturing is we will look at growth markets and we will look at areas of high volume within the business, and if we feel it is an area of low-hanging fruit, then it's something we would be prepared to invest in, and not just in bakery as well.

We have got a manufacturing division that could look at other areas of the business as well; pizza bases, for example, something like that, it's a machine cut product. So where there is opportunity, we will use manufacturing, if it is commercially viable, to support our instore operation as well as our plant operation. There is a bit of integration at the moment with the two and if we see that opportunity, then we will utilise it.

Question It's really good for us to hear how much you appreciate winning the award and it's really insightful for us to understand what goes into it behind the scenes. What would you say to people here today, independent bakers, students, Morrisons offer apprenticeships, what do you say about the BIAs for those that are considering entering but have yet to do so, in terms of the platform it offers for future careers and integration within the industry?

Andy Clegg I think if you're in the industry, then what's the worst that can happen for entering? It's a great opportunity to showcase your skill in whichever category you decide to enter. I'm always amazed by the amount of skill and the quality of the products that are represented in the various categories. So my advice to anybody is just to give it a go because even if you just go through the judging process, you will become a better operator, a better retailer, a better baker just by going through a process where there is an award at the end of it.

A lot of bakers certainly in our organisation will hide their light under a bushel and they'll think, I've made this for years, I know it's great but nobody else does, and it's like, wow this is fantastic, why don't you tell them about it? My advice is if you fit into one of the categories, enter because it's a great experience. Certainly for us it takes a lot of work. I don't know what the workload is like in the other categories, but we're committed to supporting the category. It's good for us to tell about what we're doing and the improvements that we're making all the time.

Question You work really well with the logo and the marketing afterwards.

Andy Clegg Yes. Well, it's very important because, like I said, it resonates with customers, it underpins. The fact that what you do instore is recognised as being the Instore Bakery Retailer of the Year, customers think they obviously know what they're doing. It gives that gravitas on quality and scratch and freshness, so that's why we have the logo instore, digital, press, everywhere, and also with us winning lots of other awards, it gave a story around the entire store. The timing of it, of winning the award, was just absolutely perfect.

Sylvia MacDonald Many thanks again Andy for a very interesting and wide ranging presentation with an excellent video. *Applause*

One of the pleasures of being the Session Chair is that I get to introduce to you, and especially to our students, a former top student at the National Bakery School, Devon Petrie, who worked hard to gain this honour and, as you will all know, there is no alternative to graft or to study. Devon has a First-Class Bachelor of Science Honours degree in Bakery Technology & Management, and he's a postgraduate PhD lecturer at NBS as well. His research is on cricket flour and its uses. To give us a pioneering and unusual talk, please welcome Devon Petrie.

Cricket Flour as a Protein Fortifier in Foodstuffs by Devon Petrie, Lecturer, National Bakery School, South Bank University

Thank you Sylvia for that wonderful introduction and my thanks also to the BSB Committee for inviting me to speak about the commercial application of cricket flour.

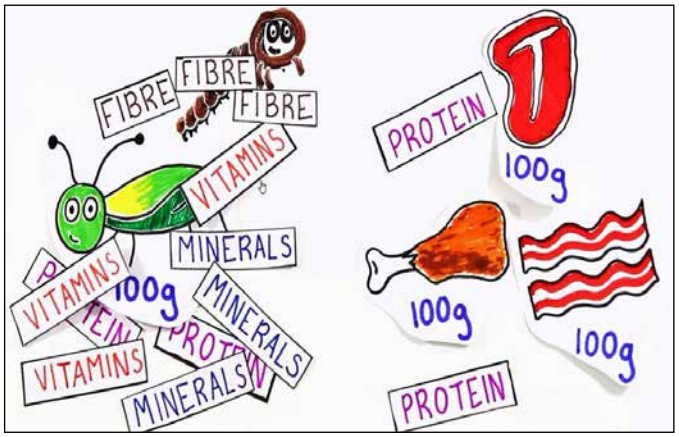
Firstly however I would like to give you some information on myself. I was born in Zimbabwe and lived there for 18 years. Sadly I saw starvation, poverty, violence and riots there due to the food shortages. This has fuelled my ambition to find alternative protein sources in food and ways to ensure sustainable protein is available in western and developing countries. While I was

in Zimbabwe, my brothers and I used to dare each other to consume crickets and flying insects, so consuming insects is second nature to me!

Before we progress through this presentation I want you to think about the most famous quote written by Charles Dickens in Oliver Twist “please, sir, I want some more”. This line from Oliver twist evokes images of a bygone era of rigid class structure, poverty and food insecurity. However, the truth is that this still exists. With this in mind, I would like you to have an open mind on the video clip which follows and the possibility of crickets being used commercially. This clip is an introduction to crickets and will give you a brief summary of their potential to change the world.

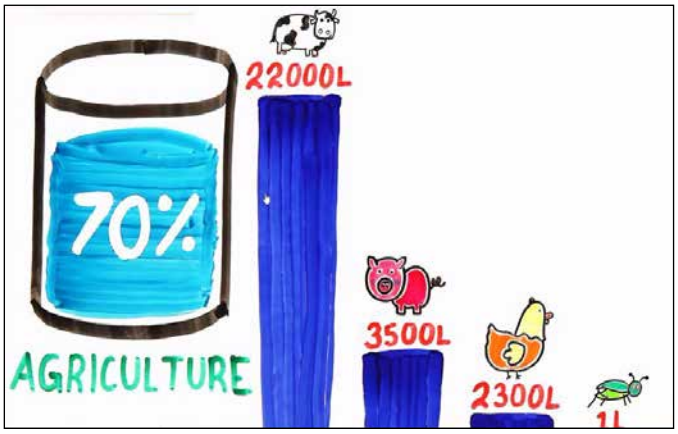
NB Some screen shots taken from the video by the conference proceedings editor Jim Brown follow.

Reluctance by consumers in the UK to eating insects!



Nutritional comparison of crickets and meal worms with meat.

Comparison of land requirements for producing crickets and meat.



Comparison of water requirements for producing crickets and meat.

Insects - the super food of the future?

Future Demand for Food Meeting demand for food for the world’s growing population is not a simple task. With the world population set to reach nearly 9 billion by 2050, we need to find alternative means to feed the population. Our current food system has major strengths but it also suffers from significant weaknesses. The food system does not generate an adequate amount of food for the world. On one hand, our food system feeds more than 6 billion people - more than previous decades. On the other hand it still leaves around 800 million people starving. It is this same food system that does not provide everyone with a healthy, safe and nutritious diet. There are people in the world who obtain sufficient calories but are still malnourished.

Slide 1 Why should we change? A food system that promotes the well-being of the people and the planet should have six characteristics. It should be: efficient; inclusive; climate smart; sustainable; business friendly; and nutritional & health driven.

We need to look at an efficient food system that produces more food using the fewest resources possible. We need to increase our resource capacity by 70% by the time we reach 2050 in order to feed the projected estimated 9 billion people. Yet as you have seen the world’s land and water resources are already under serious pressure.

We need to ensure that we are inclusive. An overwhelming majority, in fact 84%, of the world’s 570 million farms operate on less than 4 acres of land. Small farms are a critical source of income, employment, and food for

billions of people in many countries and we need to ensure that opportunities reach all areas to ensure that everyone has an important role to play in eradicating hunger and malnutrition.

Climate change is modifying the environment which has an impact on agriculture. This impacts on crop yields and we require higher yields to meet future food needs. It is estimated that by 2050, global cereal yields will fall by 20%.

Increasing sustainable food production goes hand in hand with more efficient use of natural resources. Three current trends which are currently worrying are;

- An increase in the number of calories consumed for a healthier lifestyle
- An increase in the number of people consuming more protein than required, shifting an increase in animal based protein,
- An increase in the demand for beef, which is an inefficient and resource intensive food source.

Currently we have a split society, (glutton Vs famine), with many developing countries facing the burden of malnutrition. Hunger exists alongside overconsumption and obesity, which can lead to an increase in diabetes and heart disease. This all underlines the importance of a global dietary rebalance that can free up considerable resources around the world.

Slide 2 Listen to the Experts….

- 2016 Global Food Policy Report Survey, representing 80 Countries responded to say;
  - 60% are dissatisfied with the current global food polices
  - 30% agree that global hunger can be eliminated by 2025
  - 50% aim to achieve food security, improved nutrition and promote sustainable agriculture as a top priority.
- Europe is the most optimistic about ending hunger and under-nutrition by 2025

In 2016, the International food policy research institute invited 17,000 individuals to participate regarding regional perspectives and, compared to other continents, Europe was the most optimistic about ending hunger and under-nutrition for people by 2025. This comes from identifying agriculture technologies that can promote sustainability, food security and nutrition.

Slide 3 Innovation v Conventional Protein

	Crickets	Beef	Chicken	Soya Beans
Protein	67	27	31	40
Fat	17	19	3.6	22
Ash Content	3.55	1	1	3.6
Fibre	8.3	0	0	8
Carbohydrates	8.3	0	0	25

The protein content of crickets is higher than conventional beef and chicken. Although the protein in crickets can vary from 40% to 70%, the crickets supplied for food use generally maintain the 67% mark. The fat content of crickets is less than beef and soya beans and higher than chicken, which is only 3.6%, although this is based on chicken breast. The hidden gem of crickets is the low level of carbohydrates available, and it may therefore be favoured by bodybuilders, athletes and health conscious consumers.

In 2010, an inventory of edible insect species eaten all over the world took place and is estimated that there are over 2000 different species. Of these 2000 species the United Kingdom has around a dozen which are safe to consume. I do not encourage people to start collecting and consuming crickets on their walks through the forests and fields. All crickets available for consumers within the UK, America, France and the Netherlands are reared on hygienic farms and therefore eliminating any fungal or pesticides which might be present in wild insects.

We need to think about the need for different development strategies to overcome the psychological and culture of consuming insects. Within the western society, we found that consumers find it hard to perceive that crickets are just as good as any conventional protein source. However, this was acceptable by consumers born in Asia and Africa. In a 2016 a survey suggested that young western males aged between 18 – 35 were more likely to consume crickets and accept this as a potential source of protein, However, females in the same age gap thought the concept was irrational and advised they would not buy such products.

The following need to be addressed:

Slide 4 People meet Crickets…. Crickets meet People

- To increase the familiarity of consuming insects - by providing consumers information about insects as an alternative sustainable food source.
- To make edible insects available and increase the frequencies of edible insect exposure and experimental tasting.
- Incorporate insects into familiar foods items known in the UK.

Slide 5 Market Trends and Commercial Viability

- Crickets, the next wave - health food trend. According to market trends there is an increase in popularity in products containing crickets.
  - Body builders – protein bars and protein shakes
  - Health conscious people – high protein and low carbohydrate diets.
  - Food intolerance (gluten free baked products)
- Increase in the number of chefs incorporating crickets in products.

Use of cricket flour Due to an increase in awareness, the use of crickets is slowly growing in the market. I am fortunate to be working with 2 companies to develop products and consult within this area. In 2015, I developed a recipe for wholemeal bread that contains 24 grams of protein per slice. To put this into context, eating a slice of this wholemeal bread provided the same protein intake as would be provided by eating a can of tuna. The wholemeal bread containing cricket flour had similarities in height, weight and open crumb structure to a normal wholemeal loaf.

We have found that there is a growing number of consumers who eat food products that contain cricket flour, including bodybuilders, athletes and health conscious individuals. Bodybuilders are looking for cleaner and more efficient protein and cricket flour contains all 9 essential amino acids and is therefore popular for increasing protein intake. Cleaner protein structure is the main reason why body builders and athletes consume cricket flour, as it has a natural branched protein structure, unlike some supplements where bodybuilders and athletes could be consuming substances which could be banned by the International anti-doping organisation.

Some consumers find that including crickets in their diet is beneficial because they are low in carbohydrates, allowing them to reduce their daily calorie intake. The higher quantity of protein within the product makes the human body feel full for a longer period. (Protein vs Carbohydrates). A further area being explored based on this is low glycaemic index bread which will benefit both diabetic consumers and the general public. By incorporating high protein ingredients within the product, not only can we reduce the conversion of starch to sugar, the high protein content will ensure that the consumer's appetite is satisfied without eating processed and refined carbohydrates.

Crickets can be used as a protein substitute in products such as gluten-free baked products. There is also an increase in the number of chefs who are incorporating crickets into everyday cuisine, i.e. Wahaca restaurants; cookery book author Thomasina Miers; Grub Kitchen - Wales.

Growing the market share Changes in local and international markets, including increasing the countries' demand for sustainable protein. The success hinges on how well we maximise the output of the product. The challenge of rearing animals is processing all parts of the animal. Crickets on the other hand can be reared within 43 days and the majority of the insect can be consumed. Marketing and promotion activities are currently being planned to target consumers.

Working Together By encouraging collaboration and pursuing greater supply chain integration we can grow the acceptance and availability of cricket based products. This should aim to deliver:

- Stronger relationships
- Clear communication of market requirements
- Improved competitiveness and economies of scale – supply and demand
- Greater flexibility and improved responsiveness to changes in market conditions;
- Longer term sustainability

From farmers, processors, distributors and retailers, we need to ensure that each partner is working towards the same goal, delivering a product that is sustainable.

Sustainable Growth There is now an increased focus on food security, sustainable supply and food quality in the context of a rising global population and decreasing resources. All of that has the potential to change as society has recognised that our health status, our ability to feed a rising world population and our climate are driven by how well we manage our land and its produce. We have the potential to change this dynamic through development of a more holistic approach to farming, with the goal of being one of the world's most carbon efficient regions to produce natural, wholesome food from land rich in biodiversity

Innovation Investment in Research & Development (R&D) and innovation is widely recognised as a key mechanism to achieve further development using cricket flour commercially. The benefits for individual businesses undertaking innovation include improved productivity, greater efficiency, enhanced response to customer need, faster turnaround times, increased value added through improved product design/quality and waste reduction.

Better Regulation By the end of 2017, all companies supplying novel foods must apply to the FSA regulatory body. This plays an important role in maintaining food safety and security. Good regulation for such a niche ingredient will not only advance best practice but will also help project a positive environmental, healthy and safe food image for our produce

Financing Growth Financing growth for this ingredient is difficult. Through UK Innovate, we have applied to the government for a grant which will help promote awareness of the crickets and explore viability within industry.

Food Fortress The challenge facing the industry is to harness this opportunity and to ensure that retailers recognise and reward producers delivering safe, natural, and wholesome produce while also working to high animal welfare, environmental and quality standards.

Slide 7 Moving Forward

- A significant challenge is around creating a socially acceptable food product
- A pilot project is due to be launched to facilitate and gauge the social appetite for this product incorporating awareness campaigns
- Progression and creating growth in the market
- Awareness and acceptability

Product Development Currently I am using cricket flour to develop a low carbohydrate and sugar free bread for the general consumer market.

Growth in Market Beef is the least efficient source of calories and protein. Shifting just 20 percent of the anticipated future global consumption of beef to other meats, fish and insects could save hundreds of millions

of hectares of deforestation and savannah. It is estimated that by 2023 there will be a 40% increase in insect consumption. This will be through different products for instance cricket flour, protein bars and snacks.

Acceptability Edible insects have been found to be one of the most viable and sustainable resources which can play an important role in ensuring a reliable worldwide provision of food in the future. There is always going to be a challenge regarding acceptability, however through awareness and an increase of insect products we will be able to overcome this problem.

Sylvia MacDonald, Session Chair Well, goodness me, that was very interesting. Any questions please?

Question Sara Autton Can you please give us just assurance about the humane processing of the crickets?

Devon Petrie The humane processing of the crickets is part of the process. On the 42nd day they are placed in a freezer and they slowly fall asleep, they hibernate, and they are then put into the oven to be roasted and die instantly. The process is very much similar to freezing a lobster and then boiling it. It goes into a transition period where it falls asleep and dies before it can wake-up.

Helen Ross, Fine Lady Bakeries If I mixed cricket flour with water to make a paste, what would it taste like?

Devon Petrie It depends on what product you are putting it in. For the wholemeal bread I spoke about we started with an 8% addition of cricket flour and went up to 20%. The 8% addition didn't produce much of a flavour but when it got to the 20% it left a peppery taste. If you taste cricket flour directly once it's been ground up it has a peppery aftertaste.

In developing the cricket flour cookie biscuits we wanted to avoid any element of grittiness from the cricket flour, which is not milled as finely as standard wheat flour. We therefore sieved the cricket flour using a fine sieve before using it for the cricket flour biscuits. You won't taste anything from the cricket flour in the biscuits because the addition level is much lower than in the wholemeal bread. With regard to protein, each 50g biscuit contains 15g of protein, which is a huge amount of protein in a small biscuit.

Sylvia MacDonald, Session Chair Excellent Devon, many thanks indeed. *Applause*

Paul Turner, BSB Chairman Many thanks Sylvia for looking after the morning sessions so well. Gary Tucker, who gave an excellent presentation this morning on reducing sugar in bakery products, has kindly agreed to be our Session Chair for the afternoon sessions. To ensure that the conference finishes on time after the very late running of the morning sessions, we have reluctantly decided not to take questions during the afternoon sessions. We are sorry for this but the speakers will be available when the conference finishes if you wish to speak to them directly.

Gary Tucker, Session Chair Thank you very much Paul. Our next two speakers did their degrees at the University of Cork. The first, trying to keep us all awake while we're digesting our lunch, is Ciaran Lynch, Innovations Manager at Synergy Flavours Ltd. His subject, cheese and dairy in baked products and I will let him start by saying a little about himself.

Making the Best of Cheese and Dairy in Bakery Products by Ciaran Lynch, Innovations Manager, Synergy Flavours Ltd

Good afternoon everybody. My potted history career-wise is: food science degree in 1989, finished in 1993; then a PhD in dairy chemistry and finished that in 1998. I worked for the Kerry Group for a few years and have been with Synergy and the Carbery Group for the last 16 years this year, so quite a long time with Synergy.

A thank you to the BSB for the chance to speak today on the use of cheese & dairy in bakery products. Hopefully by the end of the presentation I'll have given you some insights and ideas around how cheese is used in bakery applications. An overview of my presentation is below.

PRESENTATION OVERVIEW

- Introduction to Synergy
- Current Popularity of Cheese in Bakery
- Overview of Cheese Manufacture
- Sensory, Biochemical and Microbiological Properties of Natural Cheese and their Effect on Bakery Products
- Solutions to Concentrate Cheese and Dairy Taste in Bakery
    - Natural Cheese and Dairy Flavour Concentrates
    - Lactic Yeast Extract Enhancers
    - Customised Cheese Taste for Bakery
- Summary and Conclusions

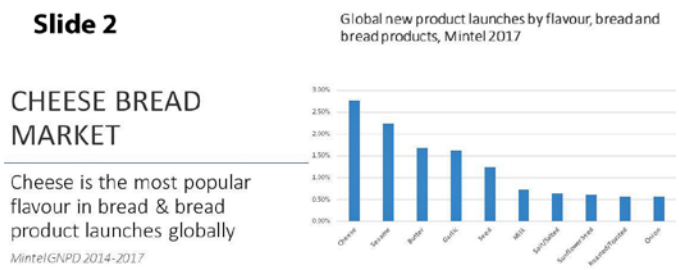
I don't want to go into too much detail on cheese making or we could be here all day, but the reason I'll touch on it is because a lot of the sensory biochemical and microbiological properties of cheese emanate from the way it's made. So we'll touch on the manufacture, we'll touch on those properties. They are properties that, I suppose, you need to bear in mind if you're using cheese in bakery applications. From that, I think you will see some of the complexity and some of the chemistry that's going on. From that you'll learn about the complexity, issues, and concerns around using cheese in bakery. Towards the end of my talk I will introduce you to some ideas around how you can manage cheese profiles in bakery. We will see what some of these issues are and then we'll introduce you to some ideas around hopefully how they can be managed. I'll talk about our natural cheese and dairy flavour concentrates, and about a unique product to Synergy, which is lactic yeast extract. I will also talk about how we take these ideas and combine them to make a customised cheese taste for bakery. To finish I will give you some product examples and a summary and conclusions.

Just a little bit of background on the company. We're Irish owned with headquarters in Ballineen in South West Ireland, South West Cork. One of the speakers this morning was talking about being food makers, so on that site we're

cheese manufacturers. We manufacture approximately 50,000 tonnes of cheese annually and we are the biggest single cheese producer in Ireland. I suppose as a flavour entity also it gives us a slightly different sense of what's going on, being food manufacturers, food producers ourselves, so it's not only just about flavour.

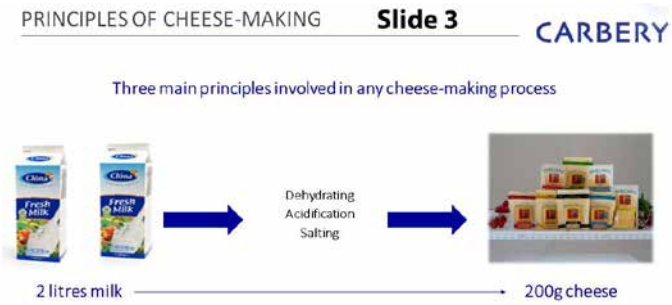
Session Chairs Gary Tucker and Sylvia Macdonald

Having said that to try and add value to the gallon of milk, the Group strategy is acquisition and it's acquisition in the flavour scene. So a lot of the content of the map in slide 1 is the result of company acquisitions over many, many years. When I started in the business there were two sites, our headquarters in Ireland and a site in the UK, and we've expanded that. In the UK now we're making a wide array of sweet and savoury flavours, natural extracts, seasonings, cuisine pastes, etc. We've been very acquisitive in the US, with three plants there, and some technology around vanilla and around aroma extraction, so making flavour extracts and essences, and that's in North America. There is a plant in South America and a plant in Thailand as well. We're servicing the globe then via agents and distributors and so on.



Again by way of background, slide 2 shows global new product launches by flavour, bread and bread products. What this slide is relating to is the current popularity of cheese profiles in bakery. This is information that our marketing guys pulled from Mintel. In conclusion, cheese is the most popular flavour in bread and bread product launches globally, which is great for us because making cheese and managing cheese flavour is what we do, so very, very popular. Butter is pretty high on the list as well, and again we've got some technology around making butter concentrates and things like that. Butter appearing where it does on the graph is not very surprising since it is fairly ubiquitous in baking.

Interesting for us as well is milk cropping up reasonably high on new launches. We don't do much milk but we do a lot of milk derivatives, things like condensed milk flavours, cooked milk flavours. We don't see a lot of demand for milk in bakery, I don't know why that is but certainly cheese and butter are popular. I suppose the reason I'm here today is the current popularity of cheese in bakery applications.



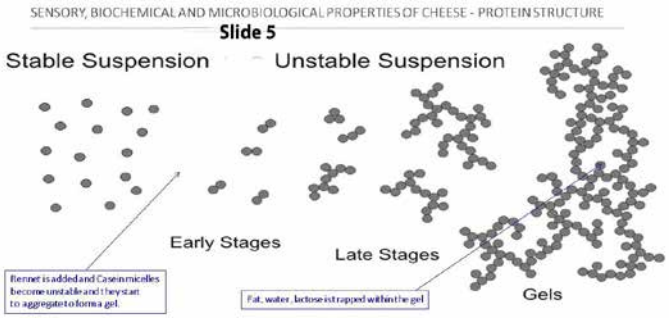
Slide 3 is a little bit about cheese manufacture and what goes on at the producer level to turn milk into cheese. Very simplistically if you look and compare whole milk, and for the purpose of this, we're talking about pasteurised milk, not homogenised but fresh cow's milk, If you look at the differences between milk and cheese, there are essentially three very important steps that take place to convert milk into cheese.

The first step is dehydration. Milk has typically about 88% water, round figures, cheese, again round figures, has on average 35% water, so the excess water has to be removed from the milk and it is removed during the production process in the form of whey.

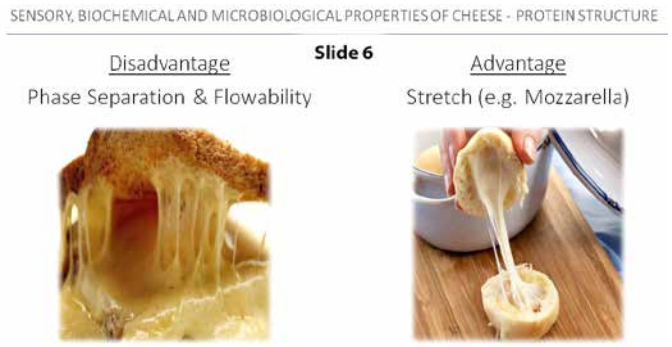
The second step is acidification. So to milk you add a starter culture of lactic acid bacteria, and this will take the pH of milk at 6.7 to 6.8pH, down to the typical pH of cheese at 5.0 to 5.5pH would be about where you would have to go.

The final step then is salting. The addition of salt is very important in cheese making since it contributes directly to flavour, it has an important effect on preservation and it has an important effect on the way cheese matures over time. So the above are the steps taken to turn milk into cheese. Slide 4 covers the factors that we need to understand when using cheese in bakery applications and we will discuss each one in turn.

Protein structure and Aggregation If you look at the nature of the protein that's in milk at a nanometer level, which is a really microscopic level, slide 5, the casein protein exists as micelles. In this form the protein isn't influenced by gravity won't settle in milk over time. The classic example of that is if you take milk and you UHT it today and you come back to it in 12 months, the protein is still there, it's still in a colloid form, it's not properly soluble but it's a colloid.

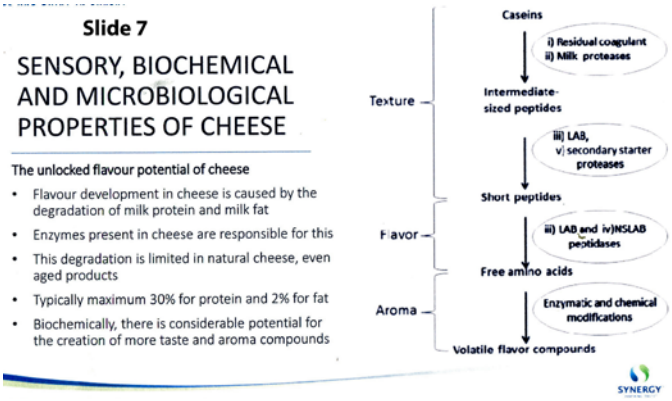


In cheese making you add rennet, an enzyme system, and the enzymes basically have the effect of taking these individual protein molecules, the micelles, and sticking them together, the glue in that particular scenario being calcium. Calcium is the glue that is holding the matrix together. So as the rennet works you initially get smaller aggregates and then over time, you get aggregation to the point of forming a network. Essentially if you are looking for a definition for cheese, it is a protein network in which fat, water and lactose are trapped. When you come to use the cheese, this could catch you out however and we'll now see why that is.



This aggregated protein state is a bit of a double-edged sword, slide 6. If you take an example of something like mozzarella, which is slightly unique in the sense that it has a cooking stretching state. It's like a partial homogenisation, which re-orientates the fat and protein and gives the cheese some good functionality. So if you're making a product like this little cheese ball on the right of slide 6, with a bit of mozzarella in the middle, then you get nice functionality. You won't get splitting, you won't get oil formation, you won't get moisture, you will just get nice even melt and stretch, so good functionality, which is what you want.

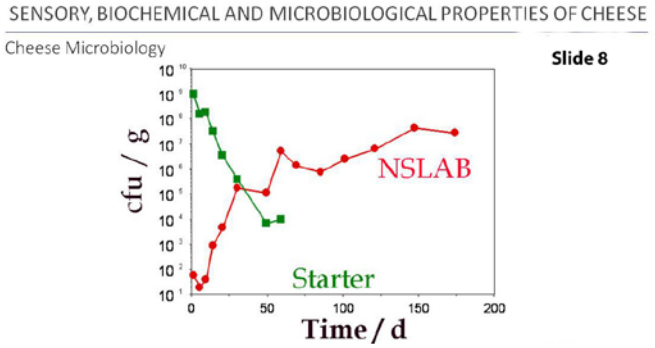
The scenario on the left of Slide 6 is not what you want. This is cheddar, and cheddar doesn't have that cooking stretching state and what you get if you stress the system by the application of heat is phase separation and the cheese will eventually separate into three phases, a protein phase, a moisture phase and a fat phase. Along with that you would get flow ability, which is not good for baking processes. So that's something that you need to bear in mind.



Unlocked flavour potential The next factor that you need to bear in mind is what I call the unlocked flavour potential of cheese. Bear in mind that the flavour in cheese is caused by the degradation of milk protein in the fat, so enzymes present in the cheese will degrade those big molecules down into smaller molecules, the idea being that the bigger molecules are not very interesting from a taste perspective but the smaller molecules are. And on the right hand side of slide we have a little example of casein degradation.

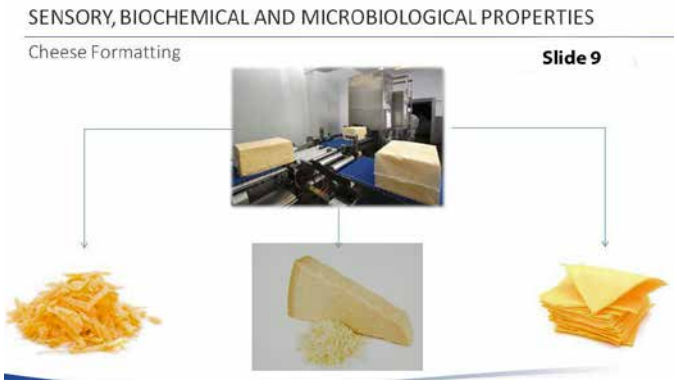
Casein is a pretty big molecule and if you've ever tasted sodium casein, it's not very interesting stuff, but in cheese the story is different because it's acted on by enzymes, so it's acted on by the residual rennet, the residual coagulant. Enzymes from the milk that survive pasteurisation, enzymes with a starter, enzymes with a non-starter, and basically what happens is that big molecule is degraded into its component parts, so into peptides and ultimately into free amino acids, and if you want really strong flavours, you can degrade the amino acids as well. So that's why that happens, that's good, that's all good, but if you look at the numbers and if you put your biochemist hat on for a second and you try and figure out, I've got casein, I want to generate free amino acids, what percentages of degradation are we talking? If you do those calculations typically, even in mature cheese, a 12/18 month old cheese, for protein you're looking at a figure of about 30%, so of that casein there is only 30% of it has gone down that channel to create flavour. The situation is even more interesting for milk fat. Again if you take very mature cheese, like cheddar, there is only 2% fat degraded. So in the case of protein, you've got 70% of the protein to go at, to create more flavour, and in the case of fat, you've got 98% of it to go at to create more flavour. So lots of unlocked flavour potential going on.

Slide 8 Cheese microbiology Microbial activity is a perfectly normal part of the maturation of cheese. There are basically two main groups of microbes in hard cheese. We spoke earlier about adding a starter culture, and you



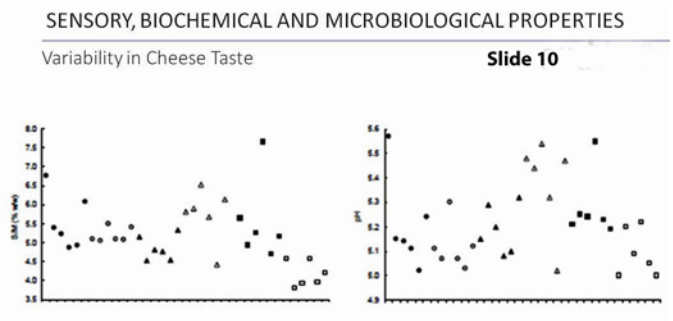
have to do that to get the acidification. The numbers of bacteria the will be pretty high at the start and the reason they decline is because of salt, which is inhibitory to starter cultures. That's fine and you want that inhibition to take place because you don't want over acidification. On the other hand, you have another group of bacteria that are a little bit hardier. These are the so called non-starter lactic acid bacteria, a different genus of bacteria, and these are quite viable in cheese, and they'll start from very low numbers but because they're viable, their numbers will go up and up as the cheese matures.

So the takeaway really from slide 8 is that if you're using cheese in your bakery product, then the chances are that you're introducing some microbes with it, so if your product has a micro spec that's reasonably tight, then you've got to be aware that for every gram of cheese, say 100 days old, you're bringing in 10 million bacteria per gram. It's all a perfectly natural phenomenon in cheese, but just something you need to bear in mind.



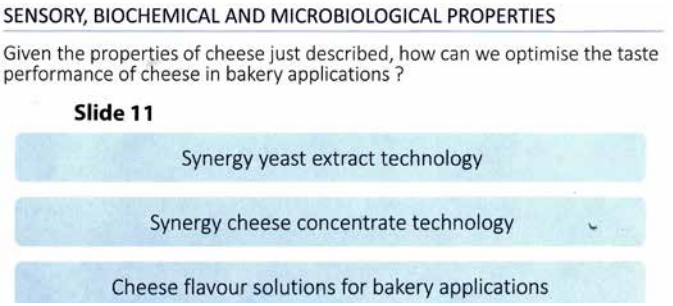
Cheese Formatting Cheese normally, certainly cheddar, would be matured in reasonably large blocks, vacuum sealed. The idea of a large block is to get a consistency of flavour and prevent water increase but primarily it is to displace oxygen. Oxygen generally in flavours is bad news and in cheese it is bad news. Generally cheese blocks should be of a size that you can handle but that they can also dispel oxygen. If you're using a cheese block in your bakery application, you've got to grate, crumb or slice it and there are two things that you need to bear in mind with this. One is the cost - you can buy pallets of block cheese at x price but the equivalent as formatted cheese, is going to be much more expensive. The second thing to bear in mind is the possible increase in the cheese micro count due to the slicing and grating operations on block cheese, which exposes a much great area of the cheese to the atmosphere.

Variability in Cheese Taste The last one then is the variation in taste. Now cheese is a natural product. Cheddar cheese could be six months old, 12 months old, or 18 months old, and the data in slide 10 is from an Irish research body called Moorepark Technology Ltd, an Irish equivalent of Campden BRI. They did a reasonably extensive study on cheddar cheese in Ireland, just looking purely at the composition. Plots for salt and moisture levels are shown on the left hand graph. They are from a range of cheese samples that cover different ages of cheese and different producers. The pH for the same population of samples is shown on the right hand graph. You can see within that range of samples lots of

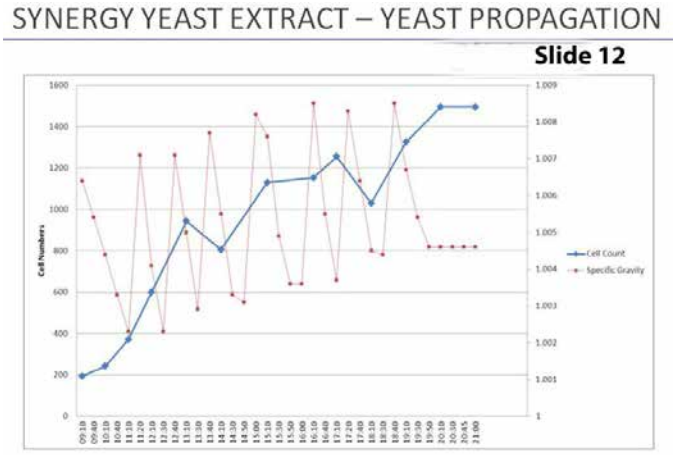


diversity, lots of different figures. You can get variation in salt content, moisture content, age or pH and all these factors that will contribute towards flavour variability.

We've spoken about natural cheese and some of its properties of the things that you need to bear in mind when using it. The general consensus is that it is a good idea to try and optimise cheese content in bakery products but how do you do that, see slide 11?

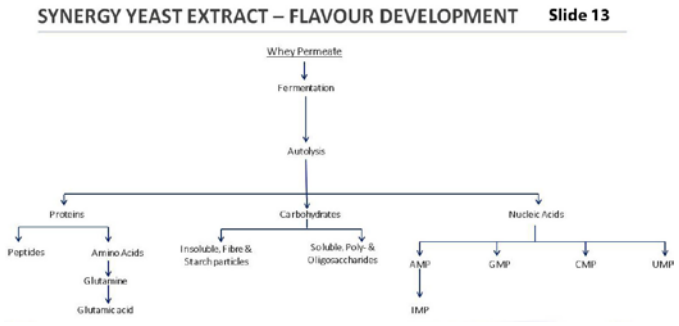


The rather squiggly looking line on the graph in slide 12 will resonate with anyone involved in producing baker's yeast. This is how we produce yeast from lactose sugar using a technique called fed-batch fermentation, allowing the yeast to grow in a stress free way in terms of its osmotic environment during production.

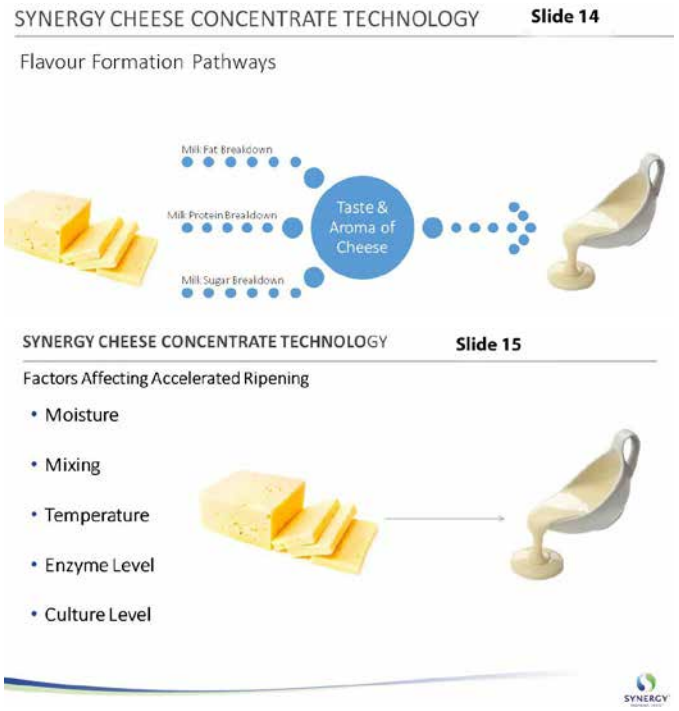


The zigzag line is basically tracking yeast content over time. Yeast production will start off with low yeast cell numbers and you feed them with lactose according to the yeast content. As the yeast content increases the level of lactose increases to feed it. Basically the idea is that you keep lactose content within fairly narrow limits so that you don't stress the yeast so you can get a nice even growth curve up to the maximum possible numbers of new yeast cells. I'm not sure how it compares to baker's yeast but producing a batch of lactose fermenting yeast is a very quick process of between 15 and 20 hours.

After production the yeast is subjected to autolysis because we want to break down the yeast components - the proteins, the carbohydrates and the nucleic acids, to their component parts. It's the exact same scenario as we have with cheese, where the big molecules are not interesting from a flavour perspective but the small molecules are. We're doing the same thing here with yeast. After production we concentrate the yeast, put it through autolysis and then look for the formation of all these interesting flavour molecules, such as amino acids, peptides, natural glutamic acid and yeast sugars. See slide 13. I suppose the two most important components of all are the IMP and GMP, the sub-components of yeast RNA (*ribonucleic acid*), which are the most potent flavour enhancers. The takeaway from this slide is that we have a unique strain of yeast which we subject to autolysis to create a unique dairy taste enhancer.



So that's yeast really briefly. The next category of products that we make, and we spoke about the unlocked flavour potential of cheese, you know it makes sense to try and harness that. The flavour formation pathways, as I mentioned, basically you want to degrade milk fat beyond its 2% natural level in cheese, you want to degrade milk



protein and you want to degrade milk sugar, and if you do that, you end up producing a concentration of cheese taste.

How do we do that in practice? Well, there are a few things that you have to do to get that flavour reaction to happen much more quickly, bearing in mind cheese will take 6/9/12 months to mature and we want to make these products much quicker. So what are the things that we change? The first thing we change is the moisture, and take the moisture content from typically about 35% to about 50% or even higher. Bear in mind all these reactions, the degradation of fat, protein, lactose, are hydrolytic reactions which need water, so the addition of water making the system more aqueous helps accelerate the process.

The other thing that we do is mixing, so we add water and mix it into the cheese, and the mixing helps to promote enzyme substrate reactions. So in a solid matrix like cheese, the enzymes and substrate are locked in place; within a liquid cheese matrix as above, they can move. So enzymes come into contact with substrate and the whole reaction happens much more quickly.

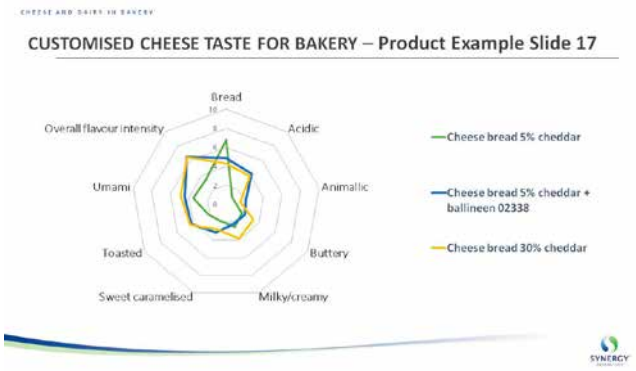
The next thing we look at is temperature. Cheese will normally ripen at fairly conservative temperatures of 10˚C or less. For fermentation and enzyme reactions, if you're looking to accelerate ripening, you raise the cheese temperature to bring it close to the optimum temperature for the enzymes and the cultures in cheese. So we would typically ferment between 30˚C and 50˚C. The last thing that we would do is to top-up the enzyme level and the culture level to accelerate ripening.

What you end up with after all of that are a couple of things that you can play with. We spoke about lactic yeast extract, we spoke about cheese concentrates, so you can take cheese and really concentrate the flavour. The other things that we bring to the party are our natural flavours. We have flavourists in High Wycombe and in the US but particularly in High Wycombe, creating all these lovely natural flavours. We have brought all of these things together to make a cheese taste enhancer specifically for bakery. You're harnessing all of the best properties of each of the things discussed earlier, so a lot of the taste components that you get from yeast, the taste and aroma from cheese concentrates and taste and aroma from natural flavours, so we bring all that together to make one product.

Slide 17 is an example of how it works. We did a little exercise in which we made cheese bread with a) 5% cheddar cheese, b) 5% cheddar cheese, plus 2% of a combination of yeast extract and cheese concentrate. c) 30% cheddar cheese, which I know you probably wouldn't in practice!

Slide 17 gives the flavour comparison between the three samples of cheese bread. Compared to the 5%

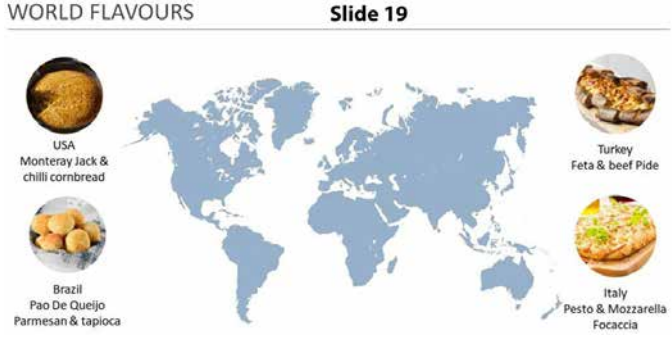
cheddar cheese bread, we're seeing all the cheese notes increasing for the 5% cheese bread with the flavour concentrate added - the savoury notes, the toasted notes, and the mature notes. Essentially by using the cheese concentrate in slide 16 in conjunction with the 5% cheese content, you're boosting the flavour level, giving you broadly the same flavour profile as an equivalent cheese bread at 30%.



One of the speakers this morning was speaking about, finishing his presentation with a happy slide. Well slides 18 and 19 are my happy slides! I'm preaching the choir here in slide 18 in terms of your understanding of how you use cheese in bakery products. There is a huge level of versatility there. I think the takeaway that I would just like to mention from slide 18 is that for certain types of products with customers, we're forced to think a little bit about how we put flavour into particular bakery products.

The cheese twist in the picture is a case in point, where we didn't flavour the pastry we flavoured the filling. I can think of other similar scenarios where we've worked on things like pizza and flavouring the pizza sauce as opposed to trying to do anything with the cheese. So the vehicle and how you get flavour in to particular bakery products is the takeaway from this.

The takeaway from slide 19 is again the universal popularity of cheese. Some breads are a little bit more difficult to flavour than others, with bread made with corn being a bit harder to put a cheese flavour into. We find a lot of combinations of cheese and meat in products today and that cheese in meat-free applications is cropping up quite a bit.



Just to mention Pao De Queijo from slide 19. I don't know if anyone here has been to Brazil but Pao De Queijo is a little cheese bread ball which is extremely popular. There are chains of stores selling the product in Brazil. We do cheese solutions for products in Brazil but if ever there was a perfect product for what we make Pao De Queijo is it. I find it very surprising that that hasn't caught on in other countries.

I have given a summary and some conclusions from my paper below.

SUMMARY AND CONCLUSIONS

- Cheese is a complex biochemical and microbiological food matrix
- It is dynamic in its sensory and biochemical properties
- It is a universally popular taste profile in food globally
- There are processing challenges associated with using cheese as an ingredient in bakery applications
- However, there are also solutions which assist with intensifying and standardising cheese flavour in bakery applications

One again many thanks for having me at your conference and for your hospitality. *Applause*

Gary Tucker, Session Chair Many thanks Ciaran. You have certainly enhanced our knowledge of cheese and its use in bakery products. *Applause*

Our next speaker is Nicole Maher. Nicole is from Campden BRI and works in the Baking & Cereal Processing Department. She's in the bakery science section and has worked on a few innovate projects and she is currently working on a gluten-free bakery project. The subject of her presentation relates to work that she has done in recent times on introducing fibre into bread, which is a very topical subject at present. As mentioned already, Nicole is a food science graduate from the University of Cork.

Novel Approaches to Increasing Fibre in Baked Goods by Nicole Maher, Senior Bakery Scientist, Campden BRI

Good afternoon everybody. I am delighted to be presenting this paper dietary fibre, an overview of which follows.

Slide 1 Overview of paper

- Dietary fibre and health
- Fibre definitions and recommendations
- Sources of dietary fibre
- Functionality of dietary fibre
- Focus on resistant starch

Dietary fibre and diets high in fibre are in the media quite a bit at present. As recently as last month, there was an article in *The Guardian* saying how high fibre diets could play a role in reducing the early onset of diabetes.

There is also quite a lot of talk in public health authorities, such as the Harvard School of Public Health, the British Heart Foundation and the Food Standards Agency, all advocating a diet high in fibre due to its improving effect on public health. So dietary fibre has a positive public image and presents opportunities and challenges, see slide 2.

Slide 2 Introduction

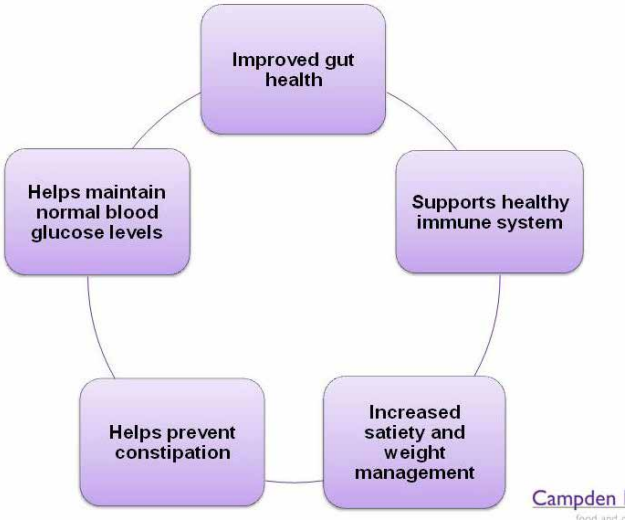
- Opportunity
  - Improved public health
  - Positive image associated with fibre enriched products
- Challenges
  - Consumer acceptance
  - Technological issues

I'm sure many of you know that there is also some challenges associated with increasing fibre in bakery products, consumer preference being one, although this may be changing. Many consumers still prefer white refined breads, pastas and rice. There are also production and final product issues with adding fibre to food products, especially baked goods.

The **health benefits** of dietary fibre were first noted in nutrition back in the 1940. It was found that pregnant women, who had diets high in fibre, had lower instances of toxaemia. Another real link between diets high in fibre and health was made in the late sixties/early seventies by a British physicians working in Africa. They noted that there were fewer instances among the African people of diseases that were common in Western Europe and America and they put this down to their diets of unrefined foods.

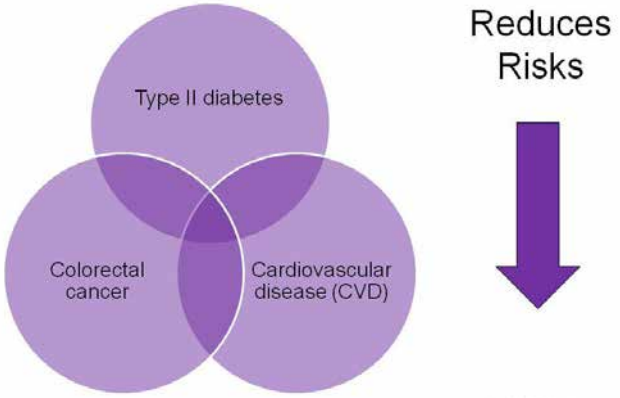
There have been many studies on the link between diet and health, and you can see in slide 3 that there are a lot of health benefits associated with dietary fibre, some of them more pleasant to talk about than others.

Slide 3 Health benefits of dietary fibre



You have improved gut health, the prevention of constipation, a healthy immune system. It also plays a role in increased satiety and weight management and this is becoming more popular, especially with the current obesity epidemic. Increased satiety is due to dietary fibre making you feel fuller for longer, increasing the amount of hormones that are associated with that feeling, the slow gastric emptying and reducing blood glucose level, which are all playing a positive role in improving health. Dietary fibre also helps to maintain normal glucose levels, which is important with some other diseases. All of the health claims or benefits in the last slide contribute towards these, so dietary fibre can help reduce the risk of some diseases.

Slide 4 Dietary fibre and disease



Slide 4 There have been quite a few studies looking at high fibre diets and these reduced health risks. For example, with colorectal cancer, a European study found that there was a 40% decrease in incidences of colorectal cancer in people who had a high fibre intake, around 35g per day, compared to people with a low fibre intake, 15g per day. This is due to increase in stool weight, improved transit time and reduced constipation.

Studies have also been done on the effect of increased fibre on reducing the incidence of diabetes. The reduction is mostly down to dietary fibres being very viscous, especially in the stomach. Due to this they reduce the rate that nutrients, such as carbohydrates, are released due to their slow gastric emptying. This gives greater tolerance to glucose response and also there is a lower insulin response, so this can all play roles in reducing, or limiting type 2 diabetes.

Finally there have been many studies looking at cardiovascular disease in relation to dietary fibre. One group looking at studies from Europe and the US found that there was a 14% decrease in the incidence of cardiovascular disease with every 10g per day increase of dietary fibre, which also translated into a 27% decrease in death from cardiovascular disease. The reason for his is similar to type 2 diabetes, with the more viscous dietary fibres in the stomach helping reduce blood cholesterol levels by altering the cholesterol and the bile absorption.

Slide 5 EU approved health claims

- Article 13.1 non-starch polysaccharides help maintain normal blood cholesterol levels and reduce blood glucose rise after a meal.
- Article 14.4a β-glucan (from either oat/barley) has been shown to lower blood cholesterol

Back of pack labelling for above

- Not included on front of pack

- Source of fibre 3g per 100g or 1.5g per 100kcal
- High in fibre 6g per 100g or 3g per 100kcal

These aren't the only fibre health claims of course. Others are associated with wheat bran, sugar beet and rye bran and they're health benefits are also associated with increasing faecal bulking.

There is quite a gap between the recommended intake of dietary fibre and what is actually ingested, see slide 6. In America it is reported that only one in ten adults meet their daily fibre requirement, making it a nutrient of concern in the US. This is not just limited to the US of course, with the UK also having problems. You will see in slide 6 that there are two values, because in 2015 the methods of calculating dietary fibre was changed in the UK in-line with the rest of the world. So it's now calculated using the AOAC which determines not just on starch polysaccharides but on some other types of dietary fibre as well.

Slide 6 Gap between recommended and actual intake

Country/region		Recommended fibre intake (g/day)	Median intake (g/day)	Body issuing the requirement
US and Canada	Male	38	16.5 – 19.4	IOM report from the National Academy of Sciences
	Female	25	12 – 15	
France	Male	30	21	*Agence française de sécurité sanitaire des aliments*
	Female	25	17	
Ireland	Male	30	23.2	Food Safety Authority of Ireland
	Female	23	17.4	
UK	Male	18*/ 30	15.2*	UK Department of Health
	Female	18*/ 30	12.6*	
Germany	Male	30	24	German Nutrition Society
	Female	30	21	

*Lower requirements due to use of the NSP method

You can see as well that there are differences between men and women, and this is noted especially in the US and Canada, and this is because it's been calculated according to total calorie intake and so it makes it a bit more difficult. If you don't consume as many calories, maybe 1,800 or something, it is going to be harder to reach that target as opposed to if you're consuming in excess of 2,000. Public health authorities are not just leaving it like this however, with attempts to increase dietary fibre intake in various ways. In Australia and New Zealand, the Nutrition Council successfully managed to increase the intake of

Public health authorities are not just leaving it like this, with attempts to increase dietary fibre intake in various ways. In Australia and New Zealand, the Nutrition Council successfully managed to increase the intake of dietary fibre. The UN also announced that last year was the Year of the Legumes to try and increase dietary fibre awareness.

Now let's look at the definition and the different types of dietary fibre.

Slide 7 Codex definition of dietary fibre

Dietary fibre means **carbohydrate polymers** [1] with 10 or more monomeric units[2], which are not hydrolysed by the endogenous enzymes in the small intestine of humans and belong to the following categories:

1. Edible carbohydrate polymers **naturally occurring** in the food as consumed.
2. Carbohydrate polymers, which have been **obtained from food raw material** by physical, enzymatic or chemical means and which have been shown to have a physiological effect of benefit to health as demonstrated by generally accepted scientific evidence to competent authorities,
3. **Synthetic** carbohydrate polymers, which have been shown to have a physiological effect of benefit to health as demonstrated by generally accepted scientific evidence to competent authorities.

Footnote 1 *states that, "when derived from a plant origin, dietary fibre may include fractions of lignin and/or other compounds associated with polysaccharides in the plant cell walls. These compounds also may be measured by certain analytical method(s) for dietary fibre.*

Footnote 2 *states that, "Decision on whether to include carbohydrates of 3 to 9 monomeric units should be left up to national authorities."*

The definition for dietary fibre has been around since the 1950s, and it was originally defined as a non-digestible constituent making up the plant cell wall. Now that is much longer and so there have been many revisions since then and many different things added into it.

The current definition was brought up by the CODEX Alimentarius Commission and it took 20 years to come up with it, through consultation with scientists and delegates from different authorities around the world. It's quite comprehensive because it now includes types of dietary fibre of all types, so like naturally occurring; those obtained from raw food materials, whether by chemical and physical means, and also synthetic ones. The whole idea of the Codex definition is for it to be accepted throughout the world and to make it easier and less confusing for consumers. It also reflects current knowledge.

You may wonder what took them so long to come up with the dietary fibre definition. Well, it's not that easy. There are many types of dietary with various chemical compositions, and different benefits. We spoke earlier about the benefits of the viscous types of dietary fibre. Also there is a bit of controversy between different functions. So the benefits of dietary fibre isn't only when it's consumed as an ingredient of food such as bread. You can you get the same benefits if you ingest dietary fibre on its own? So it took quite a while.

Slide 8 Codex definition of dietary fibre

- Emphasises the need for all types of dietary fibre
- Provides a definition that is accepted in most countries
- Empowers the food industry to innovate in developing products to close the gap between recommendations and intake

The definition came out in 2009 and it emphasises the need for all types of dietary fibre from all sources, and it is now widely accepted. Last year, 2016, the US FDA accepted the definition so now most countries around the world fully accept it. Just a quick summary:

Slide 9 Summary

- Dietary fibre consumption is linked with many health benefits
- It is associated with approved EU health claims

- Comprehensive fibre definition
- Huge disparity between recommended and actual fibre intake

Now I'm going to look at different types of dietary fibre in a more detail.

Slide 10 Main types of dietary fibre

Non-starch polysaccharides	• Cellulose • Hemicellulose • Pectin • Gums • Mucilages
Non-digestible oligosaccharides	• Inulin • Fructo-oligosaccharides • Galacto-oligosaccharides
Resistant starches	• Physically trapped • Resistant granules • Retrograded

Non-starch polysaccharides Generally speaking, non-starch polysaccharides are both insoluble and soluble. For example cellulose, which is made up of plant cell wall material, is completely indigestible by the enzymes in the human gut, whereas pectin and gums tend to be soluble. Gums in particular are not part of the plant cell wall and instead they're made by the plant. So these generally have a bit more processing to get them into a soluble fibre form, examples being guar-gum and xanthan gum.

Non digestible oligosaccharides We also have the oligosaccharides such as inulin and there is some talk about using them as a prebiotic. There is no health claims associated with them but there is an increased awareness of their benefits.

Resistant starches We now have resistant starches being used as dietary fibres and I'll speak more about them later on in the presentation.

We will now discuss the functionality of dietary fibre, see slide 11.

Slide 11 Functionality of dietary fibre as an ingredient

- Hydration and water holding capacity
- Viscosity
- Gel forming capacity
- Emulsification properties
- Fat replacement properties

Dietary fibre is not just good for our health; it can also have functional properties when added to food product recipes, particularly bakery products, see slide 11. Fibre absorbs quite a lot of water, although this does depend upon its chemical structure.

The viscosity function of fibre can play an important role in food manufacture depending on the product being produced. It affects the textural qualities of the food, not just for baked goods but for others like beverages, dairy, yogurts, etc. So something like xanthan gum plays a role in this. At very low concentrations it has a big effect on viscosity.

Gel forming is an important fibre function in certain foods. Soluble fibres such as pectin and alginates, form gels at certain pH levels and also in the presence of calcium irons. This can be very useful in food production because it can play an important role in the food matrix. For example, we did some work using an alginate gel to successfully replace part of the fat in biscuits and cakes, with the reformulated products being of acceptable quality.

You wouldn't normally think of fibre as an emulsifier but they are commonly used to replace emulsifiers for clean label products. They act as emulsifiers because they stabilise a product mix due their thickening action and they slow down the rate of flocculation.

I mentioned fat replacement earlier, with gel forming capacity being a way of replacing or reducing fat in products. Examples of fibres that can be used for this purpose are resistant starches, guar-gum, and gellan gum, a wide range.

Looking at non-starch polysaccharides in a little bit more detail, an example would be an oat bran fibre.

Slide 12 Non-starch polysaccharide - oat bran fibre

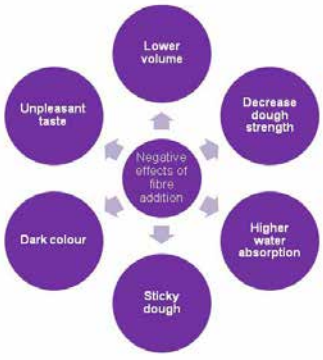
- Found on outer layers of groats*
- Dietary fibre content varies between 12-24%
- Approximately 50/50 between soluble and insoluble fibre
- Soluble mostly β-glucan (27-29%)

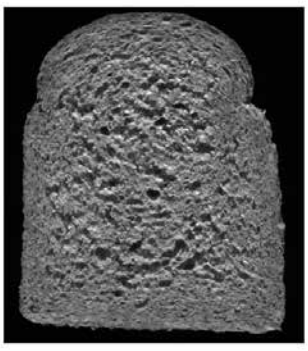
*Groats are the hulled kernels of various cereal grains such as oat, wheat, rye, and barley.

The dietary fibre from the outer layer of groats can vary between 12%-24%. This depends on the cultivar, growing location, weather and fertilisation. The fibre content is approximately split 50/50 between soluble and insoluble fractions. The soluble fraction is between 27%-29% of beta-glucans and as we spoke on earlier, beta-glucans have a health claim associated with them, so this can be very useful in a wide range of products.

I talked earlier about some of the issues of adding fibre into bread. Slide 13 is an example of high-fibre bread and is not the most attractive! It has lower volume than standard and other issues associated with it are: high water absorption, sticky dough, dark crumb colour, and its flavour is not to everybody's taste.

Slide 13 Bread quality





To improve the bread we looked at using oat bran fibre and compared oat bran with wheat bran. The oat bran in this instance did have lower fibre content than wheat bran, so it is a source of fibre rather than high fibre. The

Slide 14 Fibre enriched bread

- Compared oat versus wheat bran
- Oat gave better volume
- Milder, pleasant taste
- Source of fibre

oat bran did have the benefits of: lighter colour; milder taste; and it didn't have as negative an effect on flavour. So comparing the bread in slides 13 and slide 14, which both had the same level of course bran, the with oat bran had better volume, taste and appearance.

Gluten free bread It's not just in conventional breads that dietary fibre can be a benefit. In general gluten-free bread gets a bit of a bad reputation when it comes to nutritional composition. However for fibre content it actually comes out very well, see slide 15. This is due to the gums and fibres that are included in its recipe to try to achieve an acceptable product which compares in taste and appearance with the equivalent wheat based product.

Slide 15 Nutritional Composition of GF Breads

Table 1 : GF bread VS white bread		
	GF bread (100g)	White bread (100g)
Calories	272	241
Fat	6.1	2.5
Saturated fat	0.4	1.0
Protein	2.4	9.9
Carbohydrate	47	43.4
Of which sugars	3.9	1.7
Fibre	9.3	2.7
Salt	0.9	1.0

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The fibre content is nearly three and a half times as high as standard bread. So adding fibres such as psyllium, guar gum, xanthan gum, etc, for functional reasons in gluten free bread, they also benefit the nutritional content in terms of dietary fibre.

Slide 16 Non-digestible oligosaccharides - Inulin

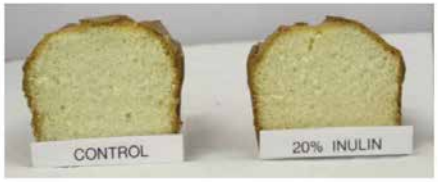
- Occurs naturally or can be synthesized
- Natural sources; banana, chicory & onion
- Approximately 10% sweetness of sugar
- Acts as bulking agent
- Neutral taste
- Forms gels at concentrations higher than 15%

Moving onto non-digestible oligosaccharides, such as inulin, they can be natural or synthesised. We've got natural sources - bananas, chicory root, Jerusalem artichoke, onions, and they have approximately 10% of the sweetness of sugar. As Gary mentioned earlier in his talk, they can be used as a bulking agent in sugar reduced bakery products and they've also got a natural neutral taste. Once hydrated and sheared, they can also form gels at concentrations higher than 15%, which also can be quite useful in some food products.

They are commonly used as sugar replacers in sugar reduced cakes, although refer to Gary's paper on this, they also increase the fibre content of the reduced sugar product. From the work that we did, see, slide 17, we found that there was comparable specific volume and water activity, and where no preservatives were used, the cake had a predictive mould free shelf-life of 13 days at 25˚C. The sensory analysis between the original and the sugar reduced cakes was also comparable. In this instance however, it's more about increasing the fibre content than reducing the sugar.

Slide 17 Increased fibre cake

- 20% sugar was replaced
- One for one replacement with sugar
- Comparable specific volume and Aw
- Sensory results were comparable to control



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Now onto resistant starch, which is becoming more popular as a fibre supplement compared to, say, non-starch polysaccharides. Its properties and benefits are given in slide 18.

Slide 18 Resistant starch (RS)

- A fraction of starch that resists digestion within the small intestine
- It is fermented in the large intestine, producing short chain fatty acids (SCFAs)
- RS provides ~2kcal/g
- RS intake estimated to be 3g/day

Resistant starch has been around since the eighties but it's only in the last few years that it's been included in the definition of dietary fibre. There are many types of resistant starch but the five main ones are shown in slide 19.

Slide 19 Types of resistant starch

Type of RS	Description	Food Source
RS1	Physically inaccessible	Whole or partly milled grains, seeds and legumes
RS2	Raw starch granular structure	Raw potatoes, green bananas, some legumes and high amylose corn
RS3	Retrograded starch	Cooked and cooled foods e.g. bread, pasta, potatoes
RS4	Chemically modified	Foods that modified starches have been used e.g. bread and cakes
RS5	Starch – lipid complex	Amylose containing starch

RS1 is physically inaccessible. So this is where the plant cell walls or the protein matrix make the starch indigestible in the intestine. It is the most heat stable and the most indigestible type of RS.

RS2 can be used as an ingredient in its native form, like raw potatoes, green bananas and sometimes legumes.

It's the actual physical state of the starch that makes it indigestible.

RS3 is a bit interesting. It's mostly in starchy types of cooked food, like pastas, mashed potatoes and breads. It is retrograded starch, so it can be affected during heating and cooling processes.

RS4 resistant starches are chemically modified. Many of you will be familiar with them because they're modified starches which are regularly added to cakes, biscuits and other baked products.

RS5 is a newer type of RS. I wasn't that familiar with it until I started looking at in more detail for this presentation. Since it is new there is obviously more work being done on it, including looking at how lipids can inhibit the breakdown of this starch in the small intestine.

Slide 20 Properties of resistant starch (RS)

- Small particle size
- White appearance
- Neutral flavour
- Increased viscosity
- Low water binding capacity

Similar to dietary fibre, resistant starch can be used as an ingredient in food products and its white appearance, small particle size and neutral flavour can be quite beneficial in this respect. One of it's the positives is increasing viscosity in products. However, one of the differences is that it can have a low water boiling capacity. For some of the fibres that we've spoken this can be quite high so this makes RS very interesting.

Slide 21 The functionality of resistant starch

- Possible to replace flour 1 for 1 without significantly affecting dough rheology
- Texture modifier
  - Increases softness in cakes and muffins
- Crisping agent - Improves crispiness of surface of products at high temperatures e.g. waffles

RS can used to replace flour one-for-one in recipe reformulations without making a massive difference to the final product, especially with the water absorption. It can be used as a texture modifier, increasing product softness in cakes and muffins - there are lots of papers looking at muffins. It also acts a crisping agent, so for products that are baked it improves the crispness of the crust and it has a similar effect when used in extruded products.

Slide 22 Approaches to increasing resistant starch content

- Plant breeding e.g. high amylose wheat
- Added ingredient
- Process changes
  - May increase RS3 of starchy foods e.g. pasta, potato and bread
  - Produced through starch gelatinization and retrogradation
  - Repeated heating/cooling

The last one is process changes. I mentioned RS3 resistant starch earlier and it's quite interesting because it's through the product heating and cooling process that RS3 resistant starch is generated. When very starchy cooked/baked foods such as pasta, potatoes and bread are cooled, chilled, or dehydrated, the starch re-crystallises and becomes indigestible. The most important thing about this that the RS produced is heat stable. So if you heat it again it will still stay indigestible. So it's taking something that would have been in the carbohydrate section of your label into your dietary fibre section, and this can be done through processing. There has been some work looking at this for legumes and they have increased the dietary fibre, or resistant starch content, by at least 50%, and that's just early stage research work.

Slide 23 Banana Flour Manufacturing Process

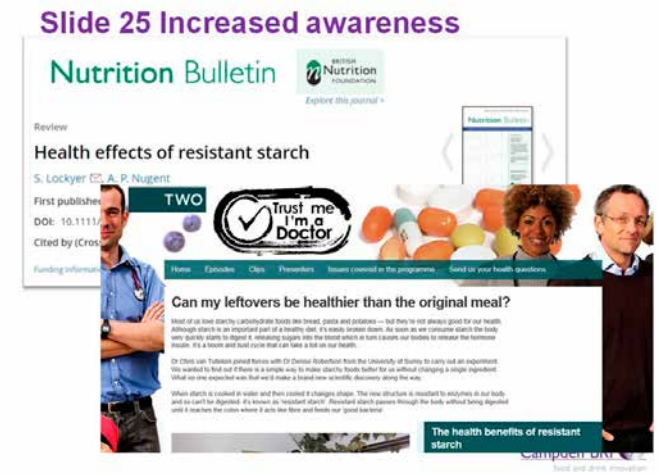
We did some work making increased resistant starch cookies using banana flour. Banana flour is an RS2 type of resistant starch which not commercially available yet, so that had to be made by hand, but that is relatively straightforward. The bananas are sliced, dried overnight at 55˚C and then ground down in a roller mill to make the end product, which can then be added to the cookie recipe, see slide 24.

Slide 24 Soft cookie recipes

	Control cookies	Banana flour cookies
Ingredients	Total %	
Granulated Sugar	24.38	24.38
Shortening	21.33	21.33
Vanilla	0.61	0.61
Whole Egg	9.90	9.90
Golden syrup	4.95	4.95
Biscuit Flour	38.09	28.49
Bicarbonate Soda	0.43	0.43
Salt	0.30	0.30
Banana flour	0.00	9.60
Ascorbic acid	0	0
TOTAL	100	100

For the banana flour cookie we replaced just over 25% of the biscuit flour in the recipe with banana flour. As you can see, there are differences in appearance between the two cookies but the banana cookie was still deemed to be an acceptable product in terms of eating quality and flavour. It was estimated that there would be about 5% of resistant starch in the final cookie. However, one thing to bear in mind, especially with RS2 resistant starch, is that it's not resistant to gelatinisation during baking. So baking or heat treatment can make it digestible and so that's where there was a bit of a loss in the resistant

starch content of the cookie. Not all of it but some of it was broken down.



Just to say a little bit about the increased awareness of resistant starch as a source of diet fibre. In January 2017 the British Nutrition Foundation released review of the health effects of resistant starch. If you go onto their website, you will find there is a lot of information about dietary fibre and now there is also a page of information about resistant starch with a link to this review, so it's getting more widely known.

Also a couple of years ago on Trust Me I'm a Doctor, they looked at a small study that was done in part of the University of Surrey. In the study they cooked pasta, chilled it overnight and then reheated it the next day and tested it to see if there was an increase in resistant starch, which there was. They found that once you cook it, chill it and even if you reheat it the next day, because it is heat stable, there is still resistant starch in it. From this study I believe that Diabetes UK is now working with the University of Surrey to look at this in more detail in relation to diabetes.

To finish off with some conclusions from my paper in slide 26

Slide 26 Conclusions

- Fibre can be used as a functional ingredient
- Wide variety of sources
- Adding value to some ingredients
- Possible approach to replacing sugar/fat
- RS may be increased by changing process conditions

Naming something as starchy fibre can add value to some ingredients, for example, oats. Not that long ago, oats were mainly used just as an animal feed and now with health claims, their use in food products is more widespread. Adding dietary fibre is also a possible approach to replacing fat and sugar in products.

Slide 27 Take home messages

- Fibre is associated with many health benefits
- Current fibre intake considerably below RDA
- Many types of dietary fibre are available
- Fibre is a functional ingredient
- Fibre can be used in wide range of products
- Resistant starch is an interesting type of fibre

So the final take home messages from today are: fibre is good for you; it has lots of health benefits but we don't eat enough of it; there are lots of different types of fibre that you can eat; adding fibre is not just for the health benefits since it is also a functioning ingredient in bakery products.

Thank you for listening. I will be here afterwards if anybody has any questions.

Gary Tucker, Session Chair Thank you Nicole for a very comprehensive presentation. *Applause.*

We now come to our final speaker Dinnie Jordan. She's a wonderful presenter and will definitely keep you awake. Her talk is about her journey with Kudos Blends and raising agents and I am sure it will be entertaining as well as educational.

Achieving the Queen's Award for Export 2016 by Dinnie Jordan, Managing Director, Kudos Blends

Good afternoon. You might wonder why I've got a picture of a scone in slide 1 when I've been asked to talk about my company achieving the Queen's Award for Export, the official title of which is the Queen's Award for Enterprise: International Trade 2016. Well my presentation is not just about getting into the 2016 Queens Award for Enterprise magazine that I am holding in the picture. In fact, when I was very kindly asked by the BSB to do this talk, I realised that getting in the magazine is a small part of everything we had done at Kudos and it all began with a scone.

Slide 1

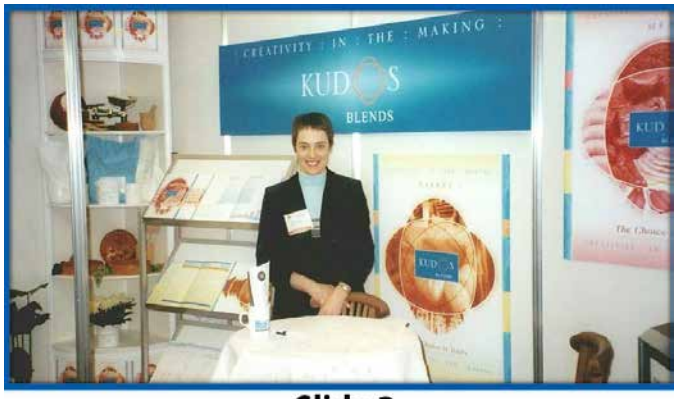
This scone was involved in a complicated project I did in 2000. I had a challenge to produce a satisfactory scone using organic raising agents, such as they are, because they don't make scone dough rise properly during baking. My customer needed to get an extra 5mm in height because they had a problem putting the scones into the acetate packs. A well-known retailer, whose name I won't mention, wanted a bigger volume and a better texture. That was my first challenge in Kudos Blends and we overcame it. So this presentation is how achieving a 5mm rise in a scone led to us winning the Queen's Award for Export.

Just to say a little bit about myself, I'm the founder and Managing Director of Kudos Blends which I set up in 1999 at the tender age of 30. I sometimes think now 'how the heck did I do that'? If had to set up Kudos now from scratch, I don't think I would have the self-confidence to do it! So I was obviously a cocky little individual in 1999 who thought I could do anything.

Slide 2

Fundamentally the reasons for me deciding to set up my own company are as follows. After graduating with a science degree I worked for a supplier of food grade chemicals called Albright & Wilson, who were based in Birmingham. I had fantastic foundation years with them, learning how a big company operates, including the discipline of how to write letters properly, and of course we didn't have e-mail in those days. You had to write your letter by hand and walk to the secretary's office to get her to type it. Then my boss would red pen it and I would have to go back to the secretary again to get the amended letter typed! I gained a huge amount of knowledge and discipline from working with Albright & Wilson and it was a fantastic opportunity for me. However what disappointed me was that Albright & Wilson was a major food grade chemical supply company but the food ingredients and bakery part of their business were small and of little interest to them.

My desire to set up on my own therefore started when I was asked to go to Manor Bakeries in Carlton, Barnsley to work on a Swiss roll project. They said it was a raising agent problem and they wanted another 1mm in volume. So off I set with two Albright & Wilson baking powders, which I knew weren't going to work. We ran the trials and I'm in the bakery all day watching failed Swiss rolls going into the dustbin! I'm mortified and embarrassed about it because it isn't Albright & Wilson's reputation being damaged it's mine. They're saying, 'you're no good, the trials weren't successful' and I felt absolutely mortified by this. Another problem with customer trials was that Albright & Wilson didn't have a test bakery or even a food mixer. If I wanted to do any tests I went to my mum and dad's house and used my mum's kitchen mixer and oven. It was ridiculous. I just thought 'I can't stand this anymore, because it is my neck on the line'. So I had this burning desire to do things differently and decided to set up Kudos Blends, which I ultimately did with the help and cooperation of many other people, including my mum and dad.



Slide 3

That's me in slide 3 at a food exhibition with my newly formed company. I launched at Foodex/Meatex in March 2000 and I did things as professionally as I could. I had my logo, which is still our logo today, had set up my company website, had my literature and I went to the exhibition full of hope. Unfortunately I only had five people come on to the stand and two of them were only looking for the toilets! I did gain one customer, a lovely lady with a business in the north of Scotland and I've still got her today as a customer.

So establishing the business was a bit scary but I had shareholders involved in my new company and they're still involved in it today. This big corporate businessman said to me, finger wagging, "Dinnie, what you need is a vision. You can't have a company without a vision". I thought, oh no, all this corporate rubbish again. I did come up with a vision however, which was that we wanted to be 'the leading supplier to the food industry of technically driven raising agents', and that's still our vision today and I'm proud to say that we focus on this one area.

I was sitting outside my house with a glass of wine last weekend thinking about this paper and I thought, 'what does that vision mean?' Saying 'we supply raising agents' doesn't tell you anything. But that's what we do; that's what I like doing; and that's what our team likes doing. We really enjoy sorting out problems for customers and there are aspects to that which takes me back to my 5mm increase in the scone height. a) There was a scientific aspect where we couldn't get the scone to rise to the required height because of the organic raising agents and b) the aspect of understanding the impact on my customer was important, because if I hadn't got that organic scone to work they would have lost their customer's entire scone business, not just the organic scone business! So it was a major concern for them. I was on my own, only six months into my business but I was passionate and had to get it to work to establish my credibility and that of my business. If my new company failed I was going to owe my mum and dad a huge amount of money from their financial help in setting up my business!

So that is what we're about, the leading supplier of technically driven raising agents. It's a great vision and I shouldn't knock it. We like to get involved with the detail of what the customer's problem is, understand his requirements and help to resolve it - that's us.

So if I look at the science bit today, I'm a chemist and in the fortunate position that whilst I might not have been a baker, I do understand the chemistry side of baking, talking about the viscosities of batter, the rates of raising agent reaction, the gas release to raise the product and the effect of starch gel point on the final product, etc. That's where I get a buzz. That's what turns me on in my business. I'm not bothered about the operational side or the factory side; I like the chemistry and the

mystique behind it and translating that into solving a bakery problem.

I took on a couple of really top-class chemists, Dan and Lawrence from Imperial College London for my business. Dan is a phenomenal chemist and due to him we've had two European patents granted and we're on the way to getting into Brazil, America and China. The exciting thing is that we're a small company with a staff of around 40, situated in South Shropshire in a rural community. My brilliant chemists have got patents for things they have created because they understand the science behind what we do.

We now have a large laboratory but what's the expression about 'activity and equipment expanding to fill the space available'? I now need to build a bigger laboratory for all the extra equipment they want to buy, but it's great because they really want to understand the science behind what they do. Dan, who is our company model, does the baking as well as the chemistry, because he's so involved and passionate about what he does, and he does a lot of eating of what he bakes as well! So that's the science-y bit.

Then it's the customer impact and understanding that scone, that first organic scone, really understanding what the problem was with it. It's a bit like you thinking you've got an ailment and Googling it saying 'I've got a pain in my left toe' and getting the answer that it is to do with the right side of your brain, or something. You make an assumption that you think you know what the problem is but when you see your doctor he asks the right questions, considers your symptoms and normally correctly assesses what's wrong with you and what treatment is required to cure it.

So as a company we have to ask the right questions to understand what it is that the customer is trying to achieve and what his problem is in doing so. Quite often the customer says, "My products are not rising in the oven so it must be the raising agent". We might blame the emulsifiers, or it could be that the recipe is out of balance, or there is not enough protein in the batter to retain the gas and hold the structure together during and after baking, so it collapses. So our challenge is to ask the right questions of the customer and really bring that understanding through to the problem that we're trying to solve.

Many of you know my colleague Michelle Biggs, who is on the left in slide 6. I liken Michelle to her Jack Russell terrier. She brings him down to the pub and he tends to latch onto to your ankle and hold on! Michelle does the same thing with a technical project or problem. Once Michelle, who's been with me for 16 years, gets hold of a project or problem she doesn't give up until she's understood exactly what the problem is and until she's solved it or completed the project.

So it is about understanding the customer impact and requirements. We also go on to the factory or bakery floor to advise staff on how best to use our baking powders and how to store them; show them what happens when you put baking powder into water, and so on. So it's not just about educating the technical people, the NPD people, it's also about training people right at the grassroots and getting them to understand how to use and store our ingredients and how that impacts on potential problems. So right the way through the business. We can have customers over to see us in the laboratory and show them how the blends work and the chemistry behind them. So understanding the customer impact is of number one importance.

Then we come on to the third aspect, passion - and passion comes from the top. I'm very passionate and of course my team are also passionate, because if they're not passionate they don't last very long with the company. I do have a great bunch of passionate people working for me. One of my values is to give the members of our team an opportunity to go abroad from time to time and also give them opportunities to do something different. Every single one of our team from ten years ago, slide 7, is still with us today and I think that's a great story.

We like to have fun, and this chap on the left in slide 8 is our site manager and he's been with us for nine years. Next to him is Donna Roper, our Sales Manager. Donna worked for me for some years but then left to work with Vet Plus in a sales role. I was very disappointed when she left because she was so good at her job and a great member of the team. Then she rang me a year later and asked if she could come back, which was fantastic and I welcomed her back.

One interesting story concerns our landlord, Phil Price, a great guy, who has been incredibly supportive to us as a business in the industrial estate. One day he asked me if I could give his son a job. I had met his son before and he wasn't very talkative but I thought, okay, I'll give him

a job; it's the right thing to do for my landlord. His son had worked for Kerry Foods on Teesside, so I gave him a job. However he turned out to be a bit of a pain and in fact I really wanted to sack him because he irritated me. It would get to 5 o'clock and he'd be standing by the clocking-in machine ready to clock out not one second past 5pm and then he'd be gone. I need passionate people working for us.

Unbelievably after 6 months of him doing this, I found out that his hobby is baking cakes and decorating them for his friends and family for birthdays and other celebrations. He'd been with me all this time and I didn't know that baking was his hobby! So I transferred him to our test bakery and sent him to Campden BRI for their three day bakery course. He progressed well in the test bakery and is now our chief bakery technologist and the most passionate baking individual ever! Now I can't get him to go home and he's doing an absolutely fantastic job.

We have used the same model of problem solving, science, customer impact and passion to grow our export business. The export business to America is challenging because we have to deal with customer recipes for products that we have never heard of, as well as ingredients we are not familiar with and legislation that is different to the UK. Often when we are trying to get new business or solve a customer's bakery problem, we have to fly in the his ingredients to use in our own test kitchen, because we simply can't get the ingredients in the UK.

So there are bakery problems, ingredient problems, and cultural difference in dealing with Americans, who take their time in getting to know you and to trust you. The first time we went out to do an exhibition in America I was filled with trepidation and I really thought it was going to be an absolute failure. We had lots of interest but we had to go back year after year after year, and on the fourth year, the Americans, who like socialising, invited us to go karaoke with them and I was like 'yes, we've made it'! So that cultural difference was a huge thing to overcome.

Language barriers and differences in terminology for things were a problem when dealing with the Americans and this lead to an embarrassment. We went to an exhibition in the US and said on our stand that we are a leading supplier of raising agents. Do you know what they think raising agents are in the US? Tablets for men with problems in the bedroom! I was like, oh no, this is just mortifying. All these people were laughing at us and so I've had to change all my literature, all my exhibition stands. We're not talking about raising agents anymore, Gary please take note, when we are in America they are now levitating agents, from the Latin root '*levis*'.

So some cultural and language differences that we had to overcome but we succeeded and now 20% of our business is exports, and we will continue to grow these exports through the same successful model that we've got there. Then it culminated with this, slide 9.

On the left is Sir Algernon Heber-Percy, Lord Lieutenant of Shropshire, who's the Queens' representative. He came

to visit us last summer and presented us with a beautiful crystal bowl inscribed with details of our award and the Queen's Award for Enterprise logo. We all dressed up for the presentation and it was a great party and celebration of receiving the award.

We're now able to use the logo, see centre of slide 9, which to date we haven't used well enough and we really need to do more with it. We have use of the logo for five years.

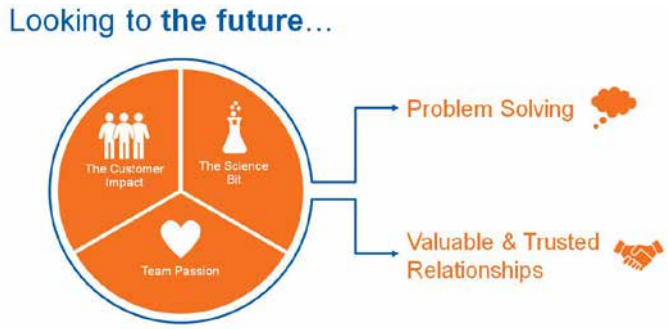
On the right of slide 9 are my husband and me outside Buckingham Palace before we stepped inside for a reception for Queen's Award for Enterprise winners, which was just superb. Unfortunately, we didn't get to meet the Queen. We realised that you had to have red dot on your badge to meet her, so next year, if we get invited again, we will have a red dot. They shepherd you out of the way of meeting the queen if you don't have the red dot and all the practising of curtseying and bowing was a waste of time, but it was a fantastic experience. I drank a ridiculous amount of champagne. I didn't realise that you had to put your hand over the top of the champagne glass if you didn't want more because as soon as you take a sip, they re-fill it.

Receiving the Queens Award for Export, the official name of which, as mentioned earlier, is the Queen's Award for Enterprise: International Trade 2016, was a huge achievement and it has all been driven by my team. We won the Chamber of Commerce Award in 2015, which gave us some experience of entering for awards. I had said to the team that we would put an entry in for the Queen's Award for Export but at the time my father was moving from Suffolk to Shropshire after my mum died and I was busy clearing out his house and helping him with the move. So I left the team to do the application for the award and I didn't know until we won the award how much effort they put in to completing the application. I didn't realise the reams of financial information and financial verification required. You have to prove sustainability, ethical trading, how you interact with the community, what plans you have for developing your staff, etc. It was a huge application and the team sheltered me from the whole thing. They never showed me any of the application, they did it all themselves, and I feel really emotional about it for them in that they achieved that award. The ridiculous thing is that we had an email come through saying we had been shortlisted for the Queen's Award and I thought it was spam and went to delete it. They shouted, 'no, it is not spam, we **have** been shortlisted'. Then we heard on the Queen's birthday that we had won the award and it was just unbelievable, it really was a culmination of everything.

Another personal story and I hope I don't blubber again. That is my mum and dad in the picture and my mum said

to me when we first started exporting, that she wanted me to apply for the Queen's Award for Export and I was like, 'don't be silly mum'! But she said 'you will apply for the Queen's Award for Export and you will win it'. I did what she said, or my team did, and we won it, so if it hadn't been for her driving it, I might not have done it. So as we went through Green Park in the tube on the way to Buckingham Palace I said a prayer and a thank-you mum.

Just to round off. That's where we are today in slide 10 with our our baking powders, selling our products to all sorts of companies around the world. It's really going well but the key thing is to make sure that we maintain the items in slide 11, since they are the recipe for our success.



What I want to do next time is to win the Queen's Award for Innovation, because we've got some superb chemistry and innovation coming out of that lab, so watch this space. Thank you very much for listening.

Gary Tucker, Session Chair As expected, very interesting indeed Dinnie, many thanks. *Applause*

Paul Turner, BSB Chairman We have had another wonderful conference and my thanks to all our speakers for their excellent papers and to our Session Chairs Sylvia and Gary, who both did great jobs.

Thanks also to everyone from Campden BRI and to my colleagues on the BSB Executive Committee, who helped make the conference a success. Lastly but not least, thank you all for attending and have a safe journey home. *Applause*

CONFERENCE PHOTOGRAPHS

Speakers & Session Chairs: Nicole Maher, Paul Turner, Dinnie Jordan, Gary Tucker, Andy Clegg, Sylvia Macdonald, Devon Petrie, Etienne Vassiliadis and Ciaran Lynch

Paul Turner, Keith Houliston, Jim Brown & Jane Tyler

Etienne Vassiliadis, Brian Clarke, Mark Young and Rob Clarke

Sara Autton gets some social media tips from John Prendergast

2017 AUTUMN CONFERENCE

Paul Turner, BSB Chairman

Good morning and a warm welcome to the 112th British Society of Baking Conference.

Some of you may have noticed that we have a number of pull-up banners. These are from our supporters, who have contributed considerably towards our funds to help students attend our conferences and to visit bakeries and bakery suppliers. Eight students and two lecturers are joining us today from the National Bakery School, London South Bank University, with some financial help from this fund. We will be hearing from the students later. We have a superb conference programme, with an excellent range of topics and talented speakers, so we can look forward to a rewarding day.

I will now ask Gordon Polson to read the BSB creed.

Gordon Polson read the BSB creed

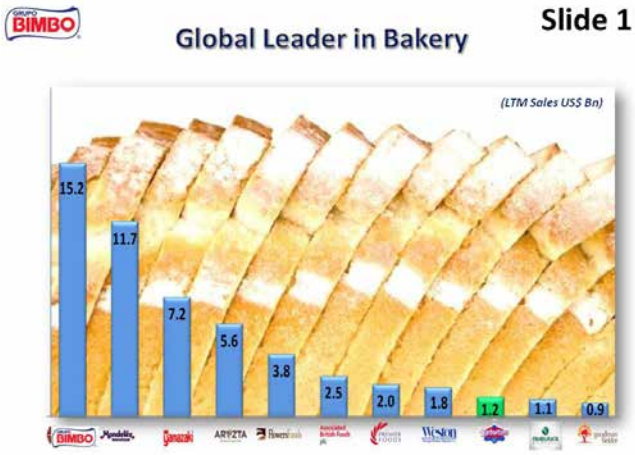
This morning's Session Chair is Sara Autton, who I am sure needs no introduction to most of you. When she was young Sara always wanted to be a baker and she considers herself extremely fortunate to be able to work in an industry where passion, energy and creative talent are in an abundant supply. Sara's career has taken her into all parts of the industry, where she has had the opportunity to meet some amazing people and where she continues to broaden her experience. Sara is Technical Manager for Lesaffre UK and Ireland, and is currently the President of the Alliance for Bakery Students and Trainees (ABST). She is also a Past Chairman of the BSB.

Sara Autton, Session Chair

Thank you very much Paul and good morning everybody. I'm very glad to introduce Cliff Irwin from Grupo Bimbo to you. Grupo Bimbo and its subsidiaries manufacture, distribute and sell a vast range of bakery products and processed foods through the global food market. Their product portfolio includes breads of various types, pitta, pizza bases, buns, croissants, bagels, wraps, cookies, and snacks - in fact pretty much anything you can eat, frankly. The company's global brands are numerous and the ones we're most familiar with in the UK include Bimbo, Entenmann's and Sara Lee. The company was founded in 1945 and its headquarters are in Mexico City. We're very glad to welcome Cliff Irwin, Managing Director of New York Bakery in the UK, who will be telling us about how the globalisation of Grupo Bimbo has benefitted the company. Please welcome Cliff.

Benefits of Globalisation in Bakery by Cliff Irwin, Grupo Bimbo

Thank you very much Sara and good morning everyone. I was asked several times last night where the name Grupo Bimbo came from and there is a nice story attached to it. Grupo Bimbo was named after the bear called Bimbo in the 1947 black and white film Bambi. The wife of one of the founders of the company loved the film and it was therefore decided to call the company Bimbo and you'll see the logo later featuring a bear with a chef's hat on. That bear was drawn by the founder's wife on her kitchen table. So the roots of the name are very humble. We use the New York Bakery name in the UK and in the US we don't tend to use the Bimbo name so much, because of the possible interpretations of it.



I am going to speak to you about globalisation but first of all a bit about Grupo Bimbo itself. I'm not here to promote Bimbo or to scare you about the size. It is just a fascinating story about a bakery group which I think you, as professionals in the industry, will find very interesting.

Grupo Bimbo We are the largest baked goods company in the world. We currently turn over about $15 billion and you can see on the left hand side of slide 1 where we sit against other baked goods products. There are companies there like Mondelez, which is the second-

largest, and this is only related to baked goods, it's not their confectionery, and probably the ones that you'll be most familiar with are Arytza, which is about a third of the size, and then you get down into Associated British Foods, Premier Foods, etc.

In terms of countries we're now in 32, slide 2. The UK business was part of Maple Leaf and we got acquired 3½ years ago. Bimbo were in 22 countries then and 3½ years on they are in 32, so you can see the very rapid rate of growth.

The business originally started in Mexico and expanded south into most of South America and then through acquisitions became the leader in the States and Canada and then has moved out into new parts of the world, establishing a business in China and then, more recently – it's an interesting story here – many of you will have seen the Bimbo bread in Spain and it wasn't part of Bimbo until about five years ago. What happened with the Spanish business is one of the original founders in Mexico left the business, left Mexico, returned back to Spain and created his own bread company called Bimbo. It traded probably for 30 years before Bimbo eventually went through various states of ownership, eventually ending up with Sara Lee, and Grupo Bimbo acquired Sara Lee and got the Bimbo business in Spain back.

So in Europe now we have Spain. We've recently, just in the last couple of months, acquired a QSR company called East Balt providing people like McDonalds, Kentucky Fried Chicken, etc. That has brought two factories in France, one in Italy, one in Switzerland, one in Russia, one in Ukraine and one in Turkey. The business has expanded out, first step into Africa. We acquired a business last year in Morocco and a very strategic move. Bimbo see a huge growth in developing countries and moving to Africa, where they can reapply a lot of the skills they've got in South America, is where they see a great growth of opportunity. It's not full but they're expanding out very quickly.

We currently have 196 factories around the world and employ 136,000 associates and we use that term, it's not something you're familiar with; they're not staff, they're not employees. One of the values Bimbo has is about the people who work for them. So one of the first things we had to do when we joined Bimbo was change our HR department to services, because people are not seen as a resource. It's a very small point but it's a philosophy that they take very strongly.

There are 1,700 Sales centres. Now a sales centre in the Bimbo world is what we would call a depot; it's a warehouse where the delivery vans go from. To give you an illustration of the size, in Mexico alone there are 42,000 vans doing daily deliveries. That is the extent of it. Mexico, an interesting little aside. I'm sure you're all aware of the phrase 'household penetration', the amount of households who have bought your products in the last 12 months. In the UK, the household penetration for toilet paper is about 98.5%, don't ask me where the other 1.5% is, it's probably students who can't afford it. In Mexico the household penetration of the Bimbo brand is 99.6%. It is quite astonishing the DSD (direct store delivery) model they have for the 42,000 vans and it works extremely well. Not only is it diverse but in most of the countries where Bimbo has gone, it's become market leader. So in the US Bimbo is number one in premium brands - for us that is plant bread, sliced or unsliced bread. In Mexico Bimbo is number one in packaged baked goods, number two in cookies, and you can see all the numbers on the slides. It's a predominately branded business. It does do private label and it does do food service as well but it's a branded business, and looks to be number one or two in most of the markets that it plays in.

The acquisitions in the last ten years are interesting. We were acquired 3½ years ago as part of Canada Bread, at a very significant price and you go, wow, they'll have to stop there, but in the last 3½ years they have acquired another six significant businesses, including the Panrico business in Spain that some of you may be familiar with, and the one that isn't even on here yet is the East Balt, which is another £$700 million of business.

This is an interesting one here, Harvest Gold. It's the leading bread brand in Delhi so three months ago we moved into India. I can't say I'm an expert on Indian law but there were some very severe restrictions on ownership and on the size of bakeries in India, so large sized bakeries were not allowed, in order to support local bakers. The new Prime Minister has taken away a lot of those restrictions and Bimbo has immediately moved in to acquiring a brand in India. If you think about the population of India, it's almost as big as China, it is enormous, and so the opportunities to grow are huge.

From a brand point of view, we have five brands that individually sell over $1 billion. The Bimbo brand itself, there is the bear - I knew he would make an appearance at some stage; Marinela is a sweet product; Thomas' is a brand from the States; Barcel are crisps basically, Arnold and Oroweat are again products from the States.

Then two brands you may recognise which are over $500 million, Sara Lee, and this is the bread side of Sara Lee, and Entenmann's. We found that people under about 40 in the UK have never heard of the brand but those over 40 can still remember the nice big cakes that used to be sold here.

Just a selection of products you can see in slide 6. Even though it's predominantly a bread company, we do sell a whole range of products. This isn't my slide, I pinched it from Mexico, and I'm pleased that our New York Bakery brand appeared on it.

Manufacturing expertise and capability are probably Bimbo's strengths, slide 7. Their capital investment each year is huge. We thought we were pretty good when we were part of Canada Bread. However I remember my first trip to Mexico to see Bimbo bakeries. We went around six

different factories in the first two days and I couldn't find a bin on the floor; I couldn't find any waste. I thought that this is because we've arrived to see round the bakery so they've cleaned the place up and removed the bins! So you drop to the back of the delegation going round and disappear into other rooms to try to find where they've hidden the bins but they didn't exist! They are running factories there with only 0.5% waste, quite astonishingly, as the benchmark and the norm. They have engineered out every part of the process where waste can be created.

Most of their factories have dead straight production lines, with glass roofs so they don't have to put the lights on, and no turns in production at all. I wish I could have that in my factories. It is quite amazing. I will show you an example later on of a factory which has just been built in Spain. They are probably at the leading edge of technology and they have a huge group in Mexico who are working on the next stage of improvements. The current rollout that is going out across the world at the moment is that they are targeting to put the x-ray machines onto every single line, to give more control over the detection of metal, glass, carbon, whatever, in products, and they've developed this with an x-ray machine supplier. From a distribution point of view, each day they go around the earth 79 times in terms of the number of deliveries and miles that they are doing. It is quite an amazing situation. I have been in Mexico going around stores, and bear in mind that most stores are small, the size of the stage I am standing on doing this paper, and they have thousands of them. You see a Bimbo van arrive, the driver takes in the fresh product, takes out the returns, collects the cash and he is away, making a delivery to the shop next door and the shop after that. Unbelievably he even delivered to a mobile burger bar that someone wheeled around. Every day he delivered burger buns to that stall, collected the cash and moved on. It was quite exceptional.

Benefits of size and globalisation

- The size and scale of our operations provide a natural advantage in mitigating some of the inherent challenges of the industry.
- Ability to leverage our global presence to share innovative products, processes and capabilities around the world:-
  - product innovation and development;
  - food safety and quality control;
  - investment in upstream Research not just product development.

- Optimisation of production platform and distribution assets
  - global procurement;
  - global best practice;
  - equipment manufacturer support.
- Advertising, marketing and sales platforms
- Talent development

Bimbo is a fantastic story and I could talk all day about things we've seen and some of the things that are going on, it is absolutely tremendous Your Brian Clarke asked me to touch on what Bimbo's size and globalisation means for us in the UK and what are the benefits for us?

The first one is size and scale. Bimbo has the advantage that if there is a sales or product problem in one part of the world, it's not going to affect too much the results overall. Let me give you an example. (Incidentally we are getting ourselves into such a knot about Brexit. I don't know how many people asked me about Brexit last night!) Anyway Bimbo are market leaders in Venezuela and have two big bread factories there. You probably don't wake up in the morning thinking about what the political situation is in Venezuela but it's pretty bad I can tell you. The country is completely broke. None of the flour that is used in Venezuela is from wheat grown there; it is all imported by the Government and then sold to the bakers. The problem with this is that the Government is broke and has no cash! So for most of this year we have been running two big industrial factories for only maybe three or four days a month, because we have no flour and we're not allowed to import our own flour because it's all controlled by the Government and they have no cash! There are riots in the streets if you read news reports on Venezuela about food shortages. So can you imagine trying to run a big industrial factory, with the cost of all your employees, etc. and you can only operate the plant for for three or four days a month! It puts the problems of Brexit into perspective really. So being able to absorb the Venezuela problem into our global business allows us to manage the highs and lows that happen across the world.

We can use our global presence to share innovative products, processes and capabilities between countries. Giving you an example here of product innovation and development is probably the best way of demonstrating it. In 2015 our business in Colombia launched a new sliced bread product using a well-established mature brand called Artesano, slide 9. It was high quality, a new type of packaging, new ingredients. It was launched in Columbia in August 2014 and did tremendously well and 2½ years on, that product now is in 19 countries and is turning over $257 million just on those SKUs.

It was our Columbian R&D team that cover Latin American Central - they have a central R&D, slide 10, that covers 12 countries. They developed this product and it is literally being rolled out across the world. In the US it's become the second highest selling SKU in sliced bread and it's only still being launched. It's just been launched in Brazil in January and so the numbers aren't quite there yet, and you can see depending on which country it's in, the brand varies. So Bimbo appears as Sara Lee in the States and Pullman in Brazil, which is the leading bread product in Brazil. It is an example of rapid deployment of new technologies, new formulations. Fortunately, we don't do sliced bread in the UK so it's not going to be a threat to anyone here!

Product innovation and development. We have three large R&D centres around the world: one in Mexico; one in the States; and one in Colombia. They are working a lot on the Research rather than Development, so they are looking at the research for things that might be useful in five years' time. If you want to meet a roomful of eggheads, the Mexico R&D centre is full of them and they are working on some fantastic things, both on ingredients and on packaging. Just to give you an example of that, this picture here, slide 10 top right, that's the R&D centre in Mexico. There are more PhDs than you can count I think in that place.

What we've introduced this year is what's called the Kitchen Lab. One of the issues on innovation is time to get from concept through to launch, and to speed it up we have this shop called the Kitchen Lab. It's on a high street and every week we are introducing between five and ten new products and we're letting the consumer come and vote with their feet; they come in, they buy the product and they take it home. It is a bread shop but it is purely new products. It's just our way of speeding everything up. Investment in development for the whole group in a very established market, about 14% of our sales are products that have been launched in the last 24 months. We've got a target to get up to 20%, and that is proper product

launches, it's not a change of packaging, it's not a little tweak, these are quite fundamental changes.

Optimisation of production platform and distribution assets The first one I've got there is procurement, sorry to the suppliers who are here. We are increasingly moving to global tenders and for us as relatively small within the group, we now participate in tenders, some of which are getting up to $600 / $700million and the prices we are getting on those are quite astounding, either on a regional basis or on a global basis. For example we do a global tender on corrugated paper. There are certain things you can't. Flour is not a global tender, that's all local, but for us global tender has been a huge benefit.

Global best practice This has been an eye-opener for us. If we want something, we have a problem, somebody in the Group has a solution or the answer. Best practice, they are constantly looking at - it is unbelievable the investment that goes in. One of the reasons that Bimbo has been so successful is that since it was first founded, the majority of the profits go back into the business; the owners don't take it out. That means that the capex we spend is enormous and it also means that the acquisitions that we've made are largely made from cash, because we're not sending out 15% - 20% of our profits in dividends.

Equipment manufacturer support I can give an example of this. We, as a relatively small business here in the UK, had a problem with a prover. We rang up the equipment manufacturer who put it in, who replied. "We'll get round to it, we will come and see you in a few weeks". Er, no, we're part of Bimbo. "Ah, yes, we'll be there tomorrow". Bimbo was about to place a big prover order for a site in California and I happened to drop that into the conversation. It is quite amazing, pricing wise, buying equipment and also the support and the contracts that we are able to get. When you have 200 plants, you have a lot of leverage. It is very noticeable having come out of a situation where we weren't really in a global bakery group into one where we are, the power you have on that is very impressive.

Advertising, marketing and sales platforms This is everything, from handheld terminals where we have global systems for taking orders, to global contracts with Kantar IRI, etc. Again just the sheer size gives us a great position.

Staff development Then last but not least talent development. In Bimbo there are 136,000 people, although I only have about 600 in the UK. I can tap into development programmes at Harvard, I can tap into what's called the Grupo Bimbo University, where basically there is a whole suite of training and development; everything from every little bit of bakery skills to equipment skills to management skills, presentation skills, whatever it is, which as a private company I couldn't do. I couldn't afford to tap into those facilities. So virtually every manager who has talent in my business can go through Harvard training, which I couldn't do if I wasn't part of the group.

Bimbo bakery in Spain Because you're bakers I'm going to show you in slide 11 something from Spain

that even I find really exciting. You probably won't know about the Spanish market but recession hit Spain really badly. The unemployment rate overall in Spain went up to 30% and for people under 24 it was up to 50%. It's been through a pretty bad time. One of the biggest retail chains, Mercadona, pretty much moved to private label only, and slashed the prices on bread. No-one is making money, a deteriorating market, a really bad position. What did Bimbo do?

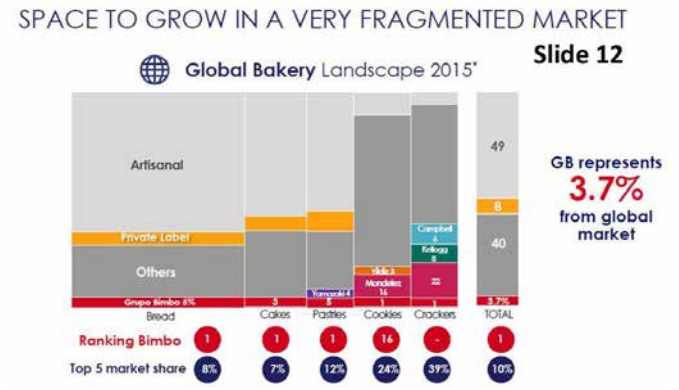
We decided that we will have to produce the best bread at the lowest price so that we can compete and be profitable at this new benchmark and compete against private label as well. So we built this factory in Guadalajara, which is just outside of Madrid. It was built from turning the first sod to producing the first loaf in 11 months. They flew in a squad of engineers and developers from around the world who lived in Spain for a year. They've produced a line there that is doing 250 loaves a minute, run by eight people in total. That's eight people right the way through to dispatch, onto the truck, including all the warehousing. Everything, right the way through is automated, from the mixing, (no-one adds anything into a mixer), it's all automated, to despatch. When the bread comes out of the packaging machine it is automatically put into trays, it's automatically palletised, robots take it to the dispatch area where it transfers and gets moved to trucks. It's quite an amazing place. Every single product goes through an x-ray machine. I've been through a lot of factories and when I go into this one I just say 'wow'!

This factory was the accumulation of all the best practices that Bimbo has developed around the world, and adopted in this factory. It was finished about two years ago and they've just built a new factory in Bogotá which is a generation ahead of it! It's gone to the next stage again. Now I'm rubbing my hands and hope at some stage I will be building a new factory for my next production lines and this is the sort of technology and standards that will be used for it. If we're going to get the best quality, the best price to meet consumer demands and the challenges we've got as an industry, this is the sort of thing that will be the future. It's expensive, that new factory in Spain cost €50 million. The market share that Bimbo has had since launch, had substantially reduced below private label but it is now back up as market leader. It has two lines: a standard bread line that's doing 250 loaves a minute; and an artisan line built alongside it producing

sourdough balls. That line is now full and they're talking about putting in a third line. The reason it's full is they're producing artisan breads on a highly efficient line and the market share they've taken has almost dominated the market in 12 months of launch. So it's an example of the benefits of being part of a larger group.

Previously when I was planning to build a new line I would be scrimping and saving, 'how can I save £10,000 here' and, 'do I really need to have that'? No, now we will do it in the Bimbo way and it will be dead straight as well, I guarantee it. Hannah who is my Innovation Manager said it will be dead straight and there is not a chance it will be allowed to have a single turn in the line. Production starts at one end and finished product comes out the other end and you never make a turn, a very simple philosophy. I have probably the largest and one of the most efficient bagel lines in the world, and we turn direction seven to eight times at least as it goes through the production floor, and that is one of the biggest and fastest bagel lines in the world. If I can get the design right the way they're doing it, it will really change and improve production.

I will stop there, just one thing. Don't be scared, we're not coming to do total domination. Bimbo is interested in growing in developing countries. Despite the size and the excitement that you feel about a global company, we only represent 3.7% of our attainable market, slide 12. The opportunity for growth is still immense, absolutely immense, and you can see we are now number one in bread globally but we've only got a 5% share, astounding. We are not going to be taking a 30% share. I can tell you now that's physically not going to happen.



Bimbo is an interesting and continuing story which is happening now and you'll hear news about Bimbo acquiring this, expanding, etc. So I hope my talk has been informative.

Sara Autton, Session Chair Thank you very much Cliff, that was a very interesting talk. Does anybody have a question? A stunned silence, wow, you've really knocked everybody out with your presentation. There are opportunities over coffee later on if you think of anything you would like to ask Cliff, please approach him then. Thank you very much Cliff. *Applause*

Our next presentation is by Emma Clifford of Mintel. As I'm sure you're aware, Mintel is the world's leading market intelligence agency, with offices on all the continents of the world, enabling them to globally define the marketing intelligence mix. The BSB has had the pleasure of hearing from Mintel on previous occasions and this morning, we are delighted to welcome their Associate Director for Food and Drink Emma Clifford, who will give us an overview of how the bakery market is currently performing, along with information on consumer habits, new product innovation and some insight into potential market opportunities.

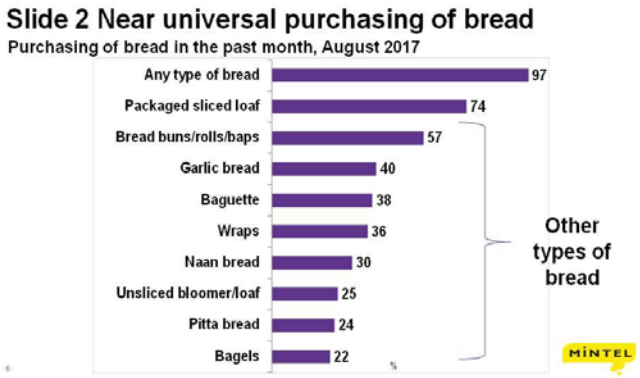
Bakery Product Trends by Emma Clifford, Associate Director - Food and Drink, Mintel

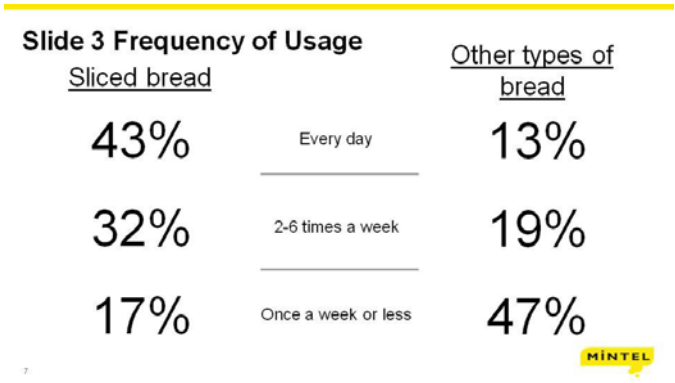
Good morning. I would like to start by introducing you to our latest report, Bread and Baked Goods, which I have just completed. It is being published later this month, so it is really up to date and will be hot of the press. The research for this report comes mostly from Mintel's latest annual report on this category.

The agenda for my paper will be as follows. I'll start by setting the scene with a look at consumer habits in terms of buying and consuming food products; I will move on to market performance; and then discuss how we expect the market to perform going forward under market forecast; I will then explore innovation trends under three main themes of healthy lifestyles, craft and flavours; finally under where next? I'll talk about some of the up-and-coming trends and where I think the opportunities lie for future development.

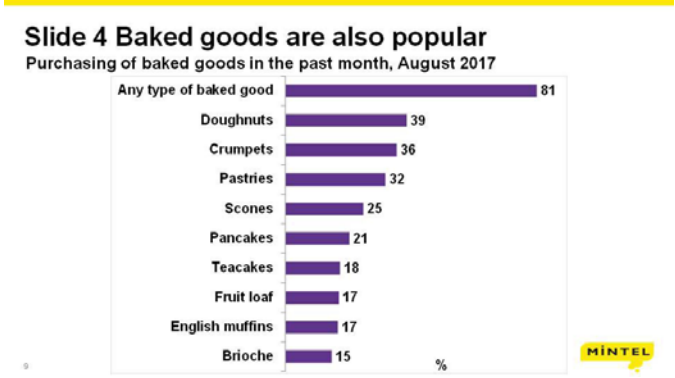
Kicking off with consumer habits and purchasing, in slide 1. Almost everybody (97%) buys bread on at least a monthly basis. In terms of maturity, the market just don't get any more mature than this.

Now breaking this down by type, the sliced loaf is out in front, so still very much a shopping basket staple for most. There is a long list of other types of bread and these are the most popular. These are the products I am referring to when I talk about "other types of bread" going forward.





Now looking at how often these products are eaten. Despite the troubles of sliced bread, which I'll talk more about later 43% of us still eat sliced bread every day and not many other food products can claim that nowadays. Looking at the other types of bread as a comparison, while - yes - these undoubtedly pose competition to the sliced loaf… they are no rivals in terms of usage frequency, with people tending to eat them once a week or less.



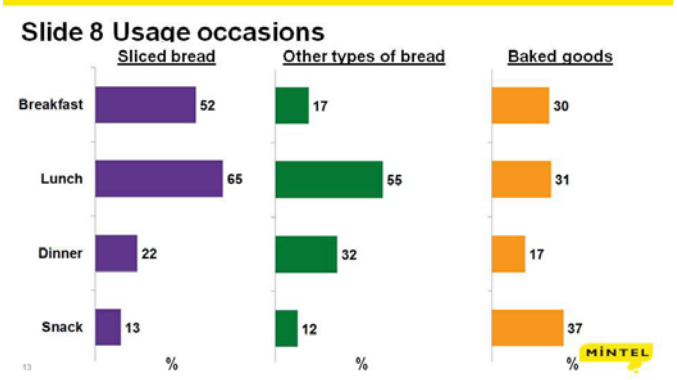
Moving onto baked goods, slide 4, these also enjoy a very high level of purchasing, bought by four fifths of consumers at least once a month.

A wide range of products fall into this category, and here are the most popular, with doughnuts, crumpets and pastries such as croissants the nation's favourites.

These are enjoyed more rarely, because they are, after all, indulgent products and they face fierce competition from other sweet treats – cakes in particular.

Now looking at usage by demographics, slide 6, sliced bread is most likely to be eaten day-in day-out by parents with young children, large households and those who are struggling financially. This reflects the versatile, family-friendly and great value for money positioning of sliced bread. Usage is also most ingrained among the older generation - whereas daily usage is fairly low among young adults – which is a challenge as it clearly doesn't bode too well for the long-term prospects of sliced bread.

Meanwhile, the user profile, slide 7, of other types of bread and baked goods is completely different. The most frequent eaters of these products are 25-34s. ABs, high-earners and people living in London and these consumers also have the widest repertoires of different products. They are also most likely to describe themselves as a "foodie", which explains why they have a zest for the greater variety and excitement offered by these products compared to sliced bread. It also means that the "foodie" trend we have seen in recent years – with more people becoming very passionate about food and more adventurous - has helped to drive up interest in these products.



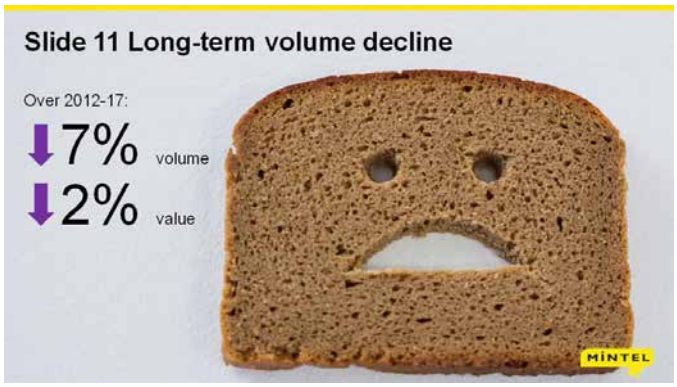
Finally, in looking at usage occasions, slide 8, there are also notable differences between the products in this market when it comes to how and when these products are eaten. Sliced bread relies heavily on breakfast and lunchtime usage. The other types of bread are also most likely to be eaten for lunch but have a bigger role to play in evening meals, with products like garlic bread, naan bread and pitta bread particularly well-suited for world cuisine for example. Meanwhile usage of baked goods is on a par for breakfast and lunch, but these are most commonly eaten between meals as a snack – which is good news for these products because we have a very strong snacking culture.

So that was a snapshot of consumer habits, now I'm going to move on to the market's performance.

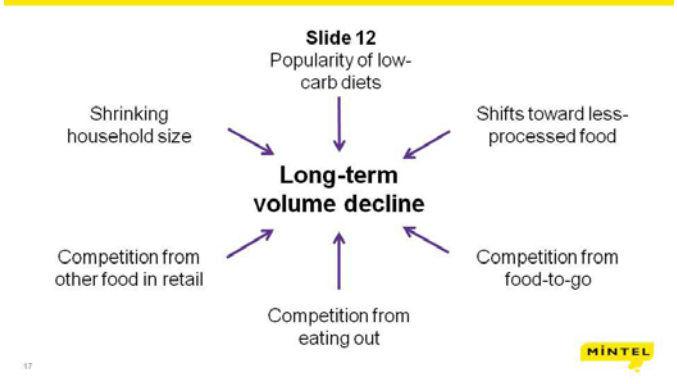
Mintel estimates that £4.1 billion pounds will be spent on bread and baked goods in retail in 2017. This equates to an average of £6.38 per person each month. With volume sales now just shy of 2 billion kg. It is still a huge

market, but it is also nonetheless one which has experienced long-term decline – with volume sales down 7% over the last five years.

There are numerous factors feeding into this ongoing decline.



These include health trends, including the popularity of low-carb diets, rising competition from both foodservice and other categories in retail and macro trends such household sizes getting smaller. So all-in-all it is a very challenging market landscape for bread and baked goods.

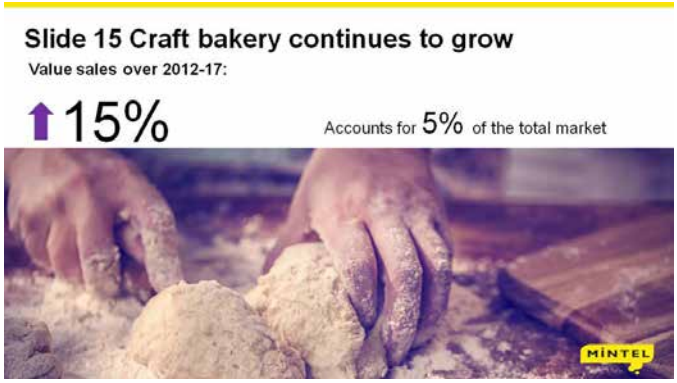


But it is sliced bread which has been the key problem area, with its role as a daily staple having been slowly but steadily chipped away. Value decline has been even steeper due to the price deflation in recent years.

Other types of bread and baked goods segments meanwhile have been bright spots in this category, slide 18, helping to offset some – but not all - of the decline from sliced bread.

2017, however, marks a turnaround and is set to see the value of the sliced bread market pick up again for the first time in four years! But this is down to recent rise in prices.

Two segments which are doing well in 2017 are sliced white bread and sliced bread with bits, which is interesting given that they are at opposite ends of the spectrum in terms of health. White bread is still the nation's favourite bread, which shows that when consumers want to treat themselves – which they haven't stopped doing - it is all about taste, they don't want any compromises, and white bread is really seen to deliver here.



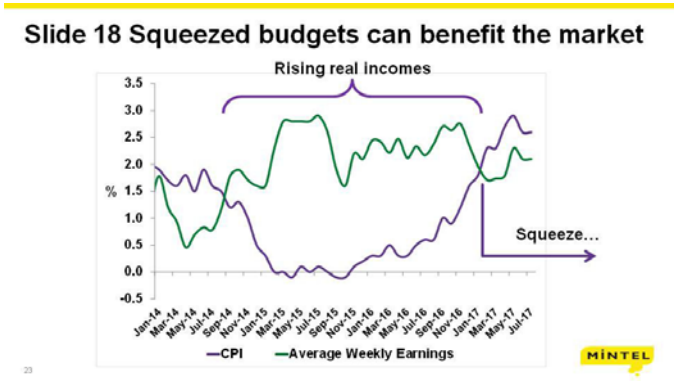
Meanwhile bread with bits is winning over consumers on its strong health credentials, while also offering them much more interest in terms of taste and texture – and for the first time bread with bits has overtaken brown bread in terms of sales – so we are seeing shifting within sliced bread.

Craft bakery – this includes independent bakers and farmers' markets. This is still a small part of the total market but is going from strength to strength. This channel has benefitted from the growing emphasis on authenticity and artisanship, as part of the "foodie" trend I mentioned earlier. The diverse and interesting range of products in craft also appeals to the increasingly adventurous consumer.

The above is what is happening at the moment. I am now going to look at what we think the future holds for the baked goods market.

From 2018 onwards, volume sales are expected to stop falling and instead level out. Meanwhile inflation is expected to drive 8% value growth over the next five years to reach 4.4 bn in 2022.

While very far from a booming market, this is a much more positive picture than we've seen in recent years. This is all down to the changing market landscape in the wake of the Brexit vote.



We enjoyed a two-and-a-half year period of rising real incomes, which supported growth in foodservice, for example with people buying breakfast and lunch out-of-home more often – which as we saw earlier are key usage occasions for bread. The squeeze, slide 18, that we are now facing should halt or indeed reverse this trend, which would be great news for bread and baked goods through retail.

There is no doubt that bread offers good value for money, being both low-cost and filling. With two thirds of people agreeing that making lunch with bread or baked goods is a good way to save money, the tougher economic climate could well spark a "lunchbox effect".

However, with competition from lots of other products, there is a need to remind consumers of exactly how and why bread and baked should still be the cornerstone of lunchboxes. And providing ideas for different ways to make these both nutritious and exciting should help to do this – with plenty of demand from consumers for this kind of inspiration.

There are also opportunities for bread to profit from consumers' dining in more to save money.

Most people agree that meals are more enjoyable when eaten with bread that specifically suits them, yet usage of other types of bread with main meals is still quite low. This

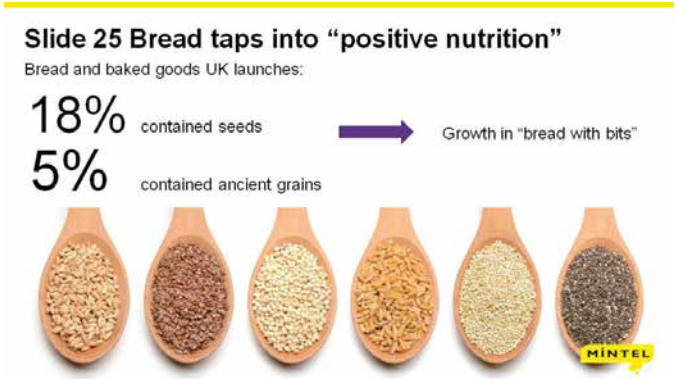
indicates scope to do more to harness this favourable perception and translate it into action among consumers. Here, positioning bread as a way to make in-home meals a more special and restaurant-like should resonate.

Now I'm going to move onto innovation trends, in terms of healthy lifestyles, craft and flavours. These are trends I think have a lot of longevity, so ongoing innovation here

will be absolutely pivotal in the market's performance – because these trends all look to have longevity.

Health is one of the biggest trends shaping the food and drink market, because we've seen a booming interest in healthy eating. This hasn't played into the bread market's hands as it has seen some consumers move away from bread and towards foods they deem to be healthier. Therefore innovation centring on health and nutrition is really important in keeping bread on the menu for increasingly health-conscious consumers.

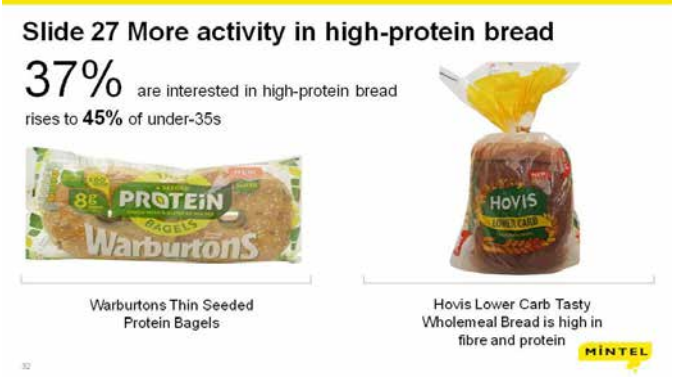
There is a high level of awareness that wholemeal bread is a good source of fibre, which is positive news, particularly given that one in four people think they should be getting more fibre in their diets. However it also means that being high in fibre is a really bare minimum for healthier bread, and with consumers able to get fibre elsewhere, there is a need to use this a foundation onto which other added healthy credentials can be layered



"Positive nutrition" is a major sub-trend within the health movement, and this is all about getting as much nutritional goodness into our bodies as possible. The bread market is aligning with this trend through the addition of highly nutritious, health-boosting ingredients - or superfoods as they are also known!

There has been a big rise in the use of seeds and ancient grains over the last couple of years, tapping into the current buzz around these ingredients.

This has really paid dividends because – as we saw earlier – bread with bits is doing incredibly well at the moment. Ancient grains and seeds - also deliver a strong "foodie" angle, it is not all about health – it's also about texture and about taste.



Here are a couple of examples of recent launches which are going all out on both fronts, mixing a diverse range of different grains and seeds with other elements: a touch of honey and being soaked in sourdough. The high-protein trend across the food and drink industry shows no signs of slowing, because the health halo of protein is proving to be very attractive to consumers. This is a really new and exciting area of innovation for the bread market. Warburtons led this march with the launch of its Protein range a year ago, with Bagel Thins a very recent addition, which suggests as least that the range is doing well. And Hovis launched a new range of bread which is both low-carb and high protein in June this year, so it is sidestepping concerns over carbs while also being a source of protein which is likely to be really appealing to consumers from a diet perspective.

Moving now onto innovation in craft baked goods. A silver lining to the trend for consumers to eat bread and baked goods less often is that it fosters a "quality over quantity" attitude, which is boosting interest in artisanship. Innovation here is helping to add value to the market, with lots of people deeming it to be worth paying more for bread that is made by hand.

It is therefore unsurprising that this a rapidly growing area of development in the mainstream market, indeed new launches with a handmade element shot up by a third in 2016. However, with more and more products going down this avenue, it becomes increasingly difficult to standout on this front. So products are starting to really go the extra mile in terms of detail, see two examples in slide 29.

This is a good idea for a number of reasons: it creates tangible quality cues; it helps to build trust through transparency; and it also meets the widespread demand for more information about how bread is made.

Slide 29 Going the extra mile in detail

43% would like more information about how the bread they buy is made

Waitrose Half Ciabattas

"expertly made using 4% Italian extra virgin olive oil, hand-shaped and stone-baked for a light, airy crumb and crisp, floury crust."

M&S Taste Spain Flatbread

"shaped by hand from extra virgin olive oil enriched dough, fermented for 48 hours for the perfect texture and stone-baked."

MINTEL

Slide 30 3. Flavours

34% Think the selection of pre-packed bread in supermarkets is boring

Rises to **40%** of under-35s

Tesco Finest Ras El Hanout

M&S Spirit of Summer Pide Flatbread

MINTEL

The third innovation trend is flavours, slide 31. This is really important in overturning the perceptions that the selection of pre-packed bread in supermarket is boring. Many consumers would welcome more exciting flavours. Flatbreads are the ideal vehicle for this, with this segment attracting a lot of exciting innovation inspired by world cuisine. Some products are really blurring the boundaries between what is bread and what is a pizza. There has

Slide 31 New twists on seasonal baked goods

M&S Savoury Cheese Hot Cross Buns

Asda Baker's Selection Apple & Cinnamon Hot Cross Buns

M&S The Collection Italian Panettone al Prosecco

MINTEL

also been a big trend to give very traditional baked goods modern makeovers with more exciting flavours, helping to grab consumers' attention and tap into their more spontaneous shopping habits when buying food for seasonal events. M&S caused a bit of a stir by bringing out cheese hot cross buns, and we are seeing lots of on-trend flavours in panettone, such as salted caramel and Prosecco. So I'd expect to see a lot happening here this Christmas too. However, exciting flavours have remained quite sparse outside of flatbreads and seasonal baked goods.

Roberts Bakery, Northwich has recently brought out very innovative new products, with gin & tonic fun buns and spicy rolls and I think innovative products like this will definitely help to inject more fun into the bread category, which should help to build engagement with the younger generation.

Slide 32 Roberts pushes the envelope with flavour NPD

Roberts Gin & Tonic Fun Buns

Roberts Fiery Corn Ready-to Rolls

MINTEL

So these are the main trends I have picked out which are gaining momentum, but now I'm going to look at some areas which are at a much more fledgling stage.

In terms of health, the three areas that I've picked out as offering more potential are: vegetables; health-boosting herbs and spices; and sprouted grains.

There is still a very limited usage of vegetables in bread and baked goods in the UK, despite them making a growing appearance in other categories – such as pasta, rice and noodles.

Slide 34 Limited use of vegetables in bread in the UK

22% of women would be interested in buying bread containing bright veg

M&S Beetroot and Spinach Wraps

MINTEL

These beetroot and spinach wraps are very innovative launches in this space, they definitely caught my eye because they are so bright and vibrant, and so they tap into the idea of 'colourful eating', where food is actually seen to be bursting with nutritional goodness.

Slide 35 Global examples of vegetables in bread

Mixed Vegetables Bread with Cabbage and Carrot (Russia)

Vegetable Bread (Denmark)

Supergreens Bread with Spinach, Nettle & Millet (Germany)

MINTEL

Innovation is much more commonplace in other countries, slide 35. It is not just all about health, since the use of vegetables can also lend a more interesting flavour profile, and appeal to consumers wanting to try something a bit different.

Spices have evolved to be much more than simply a means of enhancing the taste of food, with consumers now switched onto the health-boosting potential of these ingredients. Turmeric in particular has been hailed as a 'wonder spice'. The idea of adding health-boosting herbs and spices to bread and baked goods is really popular! Yet there is currently almost no innovation in this area! A very rare example of where this is already being done in the UK is Profusion Turmeric Bread, made with organic rice and millet. I think so much more can be done in this area.

The use of sprouted grains is an area which is really in its infancy, even on a global level. But this could be the next step for the already very popular use of grains and seeds in breads. The US is really leading the way with sprouted grains in bread, and with health trends often coming over from the US to the UK, I don't think it'll be long before this starts to make more of a mainstream appearance in the UK.

I think snacking still represents a largely missed opportunity for bread. While baked goods do quite well here, consumers aren't making a connection between bread and snacking. Bread on its own is poorly-suited out-of-home occasion, requiring to be spread with butter or margarine, and a topping or fillings added, with limited availability of single-portion or individually wrapped options. Innovation is needed to overcome these barriers if it is to capitalise on the very lucrative snacking occasion.

There is considerable demand for more snack-friendly NPD, with the most popular concept being savoury rolls with baked in fillings. I've just picked out a couple of products in slide 39 which I think are quite cool examples: two focaccia bread snacks and a new range called Middles in the US which have cheesy fillings.

The key points of my conclusions are:

1. A squeeze on finances can create a favourable setting for the bread and baked goods market.
2. A need to keep bread relevant and front of mind, targeting specific usage occasions – including snacking.
3. Innovation will be pivotal in the market's performance: health, craft and flavours are set to remain as key themes.

That concludes my presentation and many thanks for listening.

Sara Autton, Session Chair Does anyone have a question for Emma? No? Therefore thank you Emma for an excellent and wide ranging presentation and it was great that it was hot of the press in terms of your Bread & Baked Good Mintel report. *Applause.*

Paul Turner, BSB Chairman Welcome back from the coffee break. Please give a warm welcome to the National Bakery School's Elaine Thomson, Course Director, Devon Petrie, Lecturer, and eight of their students. I will now hand you back to Sara as Session Chair for the NBS presentation.

Sara Autton, Session Chair I'm very pleased to be chairing this particular session because the London South Bank University's National Bakery School (NBS) is my old college and I had a great time there. Including me, there are several of the NBS's alumni here today, all of whom have enjoyed long and successful careers in the industry.

The NBS boasts an international reputation for industry influenced courses and has benefitted in recent years from substantial renovation and modernisation that leaves it well-placed to continue its work in preparing students for the challenges and joys of all aspects of the baking industry. The school focuses on practical learning backed by sound theory in order to maximise the potential employability of its students. The wide ranging specialisms of the NBS teaching staff ensure that the students enjoy a rich and varied learning experience, coupled with an enthusiasm for continued learning throughout their careers. We are very pleased to welcome

back NBS lecturer Devon Petrie, who you may remember gave us an enlightening presentation on cricket flour at this year's BSB spring conference at Campden BRI. Devon promises me that he's not going to force anyone to eat crickets today! I am pleased to also welcome eight of his students, three of whom will come onto the stage with me to form a question and answer panel, together with Devon and Elaine So that we know what you all look like, would all the students please stand so we can give you a round of applause. *Applause*

The National Bakery School, LSBU by Devon Petrie

Good Morning everyone, and thank you Paul and Sara for that wonderful introduction. The National Bakery School is recognised as the oldest bakery school in the world. It opened its doors on the 25th September 1894 and offered students both full-time courses during the day and part-time courses during the evening. On 5th February 1902 John Kirkland was appointed Head of the Department and he set out to write the fundamental manuals for the NBS, known as the Modern Baker, Confectioner and Caterer and I am a proud owner of a set of these books. There have been many changes and modifications to the National Bakery School over the years, it having to adapt and respond to changes in the baking industry. For instance, in 1992 the NBS developed Bachelors and Honours degree courses in Baking Technology and Management, the first of their kind in the UK. Although this bakery degree programme remains the same, there is continual development to refine and update the degree course studies to meet changes in the industry.

Pondering on the above, Nelson Mandela once said: 'action without vision is only passing time. Vision without action is merely daydreaming, but vision with action can change the world.' At NBS we ensure that we develop the students' philosophy to make an impact and drive in the baking industry. The students here today are: Grace Booth, Akerah Allen, Adam Thompson, Bethanie Dove and Lucy Brown from our Foundation degree course: and Kieran Slator, Shaman Stocker and Sarah Clifton from our Bachelor of Science Honours degree course.

In the following video 12 NBS students each discuss the course they are doing and their aspirations for a career in the baking industry after they graduate. The video is interspersed with scenes from NBS practical bakery classes and pictures of bakery products. After the video Kieran, Shaman and Sarah will join Sara Autton, our Course Director Elaine Thompson and me on stage for the question and answer session.

NBS Video The video was shown and was followed by appreciative applause from the conference delegates. Screen shots of the 12 students on the video follow.


Akerah Allen


Devyani Bali


Beth Dove


Toby Stokes


Megan Flashman


Grace Booth


Emma Lloyd


Lucy Brown


Amy Walker


Shaman Stocker


Sarah Clifton


Sophie Braker

Sara Autton, Session Chair Brian Clarke has a roving microphone and if you want to ask a question please put up your hand, wait for the microphone, introduce yourself and your home town and ask your question. I will then ask an appropriate person or persons to answer it.

Paul Weston, BSB Committee It is fantastic to have you all here today. Well done so far in your studies and all the best for the future. It's very important that the NBS evolves its programme to keep up with modern trends and we've seen some references to this in your video presentations, as well as your visions on what you want to do in the baking industry when you graduate. What can we do from an industrial point of view to help you facilitate the transition from student to a modern day worker in the baking industry?

Shaman Stocker I know from my experience that many of you guys already do so much for us. I worked with David Hall in my first year and he really helped me get into conferences like this and make contact with bakery suppliers. So I got to speak to people in the industry and see what their companies do. I've met with Zeelandia a lot, and a friend of mine, Becky Hall, works with them now, so I still have a connection with them. I think making yourselves available and for us to know that we can send you an email maybe for a day's work experience, to see how you run your bakery, or produce ingredients would be really helpful for us - and for you if it is work experience, its free labour for a day! It is also something for us to put on our CV and that helps to show prospective employers that we have had some experience in many areas of the industry.

Elaine Thomson, NBS This is a good opportunity to let you all know that we have a careers fair on 29th November 2017 at the NBS. So if any of you want to engage with us in that way you would have an opportunity at the Fair to meet with students from across all study years, and learn more about the courses they are doing. I strongly urge you to get on board and then continue with our relationship.

Devon Petrie, Shaman Stocker, Kieran Slator, Sarah Clifton and Elaine Thomson

Sara Autton Thank you Elaine, we will be beating a path to your door. Anyone else?

Eric Balzan. Montana Bakery, Slough I think when you get into this industry, very rarely are you allowed to escape and certainly it's a wonderful industry to be in. So personally why have you chosen bakery and what drives you?

Kiernan Slator I studied catering at Level 2 GSCE at school and then I went on to do food science and nutrition at A level. At the time there were only four of us doing the course and my teacher was desperate for us to do something different to conventional subjects and encouraged us to do what we enjoyed doing. During my sixth form therefore I looked at doing a degree in baking instead of cooking. As much as I enjoyed cooking, I wanted to know how I could further my baking knowledge from going to university, and also learn about the science behind it.

So it was good to get into baking from this route. I was the first person from my school to go to the NBS and since then there is someone else from my school in their first year at the NBS who came after me. This student was encouraged to do it by my teacher because she knew this option was there at the NBS, to give pupils a choice between baking and the more conventional catering and hospitality option.

Sarah Clifton I always favoured subjects like technology when I was in secondary school and I enjoy designing and making things and innovating. I couldn't really find a medium for me for these interests until I found information on the NBS bakery degree courses. After considering it carefully I decided to do the course and I really love it. Baking is the industry I want to be in.

Sara Autton, Session Chair Those comments are great to hear. I'm sure everybody in the audience also appreciates the differences between being a chef and being a baker but it's not something young people often find out about in the wider scheme of things when considering a career. Any other questions?

Tony Staniforth, Hovis If you look back over your time at the NBS and the course that you're doing, which aspects of it has benefitted you the most and why?

Shaman Stocker When I started my course at the NBS I had few practical skills and little technical knowledge about baking. I knew how to make a basic cake and decorate it in whatever theme I wanted. I didn't really know much about bread and I knew nothing about chocolate. So having modules on the course that really go into depth on these subjects really opened my eyes a lot. I've worked with Jane in a couple of her extra practical sessions and I've learnt cake decorating and other skills that I never thought I would be able to do. The theory classes helped me a lot because, for example, I had no idea how much work, market research and test bakes you had to do in product development, so that was a really big insight for me. The business module was also very useful since I wanted to know how to run a bakery and didn't know where to start. That has given me a starting point when I finish my degree course if I want to open my own bakery.

Kieran Slator, National Bakery School At the NBS we often have talks from bakery suppliers and other people involved in the industry and we get opportunities to visit bakeries and other work environments, such as ingredient manufacturers. This has been a great opportunity for me to go out of my comfort zone and learn something new. I worked in craft bakeries in South London for around four years before doing the NBS course. I learnt a fair number of practical skills during this time, particularly on breadmaking, but it was very limited. To now have the opportunity to gain a wide range of skills covering all aspects of baking, together with technical knowledge, is fantastic.

Sarah Clifton To add to what Shaman and Kieran have said, even when you do not have a lecture at the NBS, there is always something else going on, such as a seminar or a visiting speaker. Last year we hosted the International Chocolate Awards, so it was a fantastic opportunity for us to help out with that. There are always opportunities for us to talk to people, to do different work and to gain experience through that.

Elaine Thomson, NBS To add to what Sarah has been saying, I want to emphasise that the students have a lot of valued-added things they can do. We have the Clarence Centre for Enterprise where they learn how to be entrepreneurial, how to get on in the industry and how to succeed. So I think that is an added bonus to their normal study when they are with us.

Sara Autton, Session Chair Yes, it's nice to hear from these well rounded individuals that are going to be coming out into the baking industry after graduation. Something that I certainly found when I was studying at the NBS is that there is a lot more to baking than flour, water, yeast and salt, there being a multitude of aspects around it. With regard to deciding on a career after graduating, when I went on the NBS course I was convinced I was going to be the best cake decorator in the world. It wasn't until I got on to the raw material science module on the course that I got into the aspects of what I'm doing now as Technical Manager for an ingredients manufacturer. I'm still doing it and still loving it. So it's really important that it's not just about baking, but about all the aspects of the baking industry you look at in terms of a future career. and I think it's great that you are able to do that.

Robin Jones, Village Bakery Does the NBS offer you opportunities to broaden your knowledge of the baking industry and give you exposure to it and how do they do that?

Sarah Clifton As I was saying earlier, we get a lot of opportunities to learn about the industry within the NBS and not just through lectures. We have seminars; we have companies coming in to do taster days; or give a PowerPoint presentation to show us what they do. We

get opportunities to visit bakeries, and we are always in contact with people who work in the industry. There are various sectors of the baking industry that we're exposed to, not just traditional baking. We get to talk to people from all areas of the industry, which gives us a range of options for when we finish at the NBS.

Elaine Thomson, National Bakery School We also have a lot of input from lecturers who teach at the NBS but also work in the industry. So they are enriching the student's knowledge of the industry as well.

Devon Petrie, National Bakery School Just adding to this theme, many food related companies use our facilities for NPD work, company days etc, because we are based in London. Last year we had a pastry chef from Abu Dhabi using our facilities for some NPD for his company. At our request he then gave our second and third year students a private demonstration on the production of pastry products. This pastry chef from Abu Dhabi, with 25 years' worth of skills in pastry production, gave them a hands-on, pretty much one-to-one, experience in using lamination and production techniques for a variety of pastry products, and improved their knowledge a great deal. So we try to do all we can to introduce the students to all aspects of the industry.

Sara Autton, Session Chair That's great Elaine and Devon. With regard to people from across the world can I ask Cliff Irwin of Grupo Bimbo, "Cliff, if you have any people coming to the UK from Bimbo's bakeries in Mexico or other parts of the world, perhaps, if they had time they could visit the NBS to talk to the students about baking in their country". I am sure the students would greatly appreciate it. Any other questions?

Brian Clarke Sarah, Kieran and Shaman, you have a great chance today to tell some of the leading people within the baking industry what skills and qualities you will you bring to a role in the industry when you've graduated? Now is your opportunity!

Sara Autton, Session Chair Yes, sell yourselves. Why should we employ you?

Sarah Clifton As I said before, I like doing innovation, coming up with new ideas, seeing what the issue is and coming up with an inventive way to solve it. I'm also a little bit of a perfectionist when it comes to baking and everything to do with it, so I always make sure everything is perfect. Within the university I am on a lot of committees and I am part of the Students' Union. So from this I have gained leadership skills and learned the importance of teamwork, so together with what I am learning at the NBS, that is what I can bring to the baking industry.

Sarah Clifton, left, answers a delegate's question

Kieran Slator I used to hate doing interviews so I got my first job by harassing a local baker for four weeks in a row for a job. I went there and said, can I work for you? He said, how old are you? 17. No, you're too young and you're not insured. I went back the next week, can I sweep the floors? No, you're still too young to be in here. Can I work on the tills? Until eventually he was like, "okay, you can have the job". He hired me and it was great to learn on that scale.

Coming to the Baking School, in the first year we do a lot on writing CVs, doing interviews, and one of our assessments is on being able to sell yourself in a way that people want to know you and talk to you. Having the opportunity of being part of the ABST to compete and work with, and against, all the other people in the country who are learning, to try and show that you can do what you can do. I entered a chocolate competition and I managed to come first and the prize for that was going to Banbury to do a course at the Chocolate Academy. So through that, I have met top chocolate workers, people who can really help us, and just a name to know and who can be a good reference for me. Working with our chocolate lecturer Barry Johnson, who has just won the UK heat of the Chocolate Masters has been great. We've been helping him in the last few days to prepare for the competition and to wash-up for him. Just watching how he prepares for the competition was great experience. Hopefully he will teach and encourage us to get to that level of expertise ourselves one day.

Devon Petrie, Shaman Stocker & Kieran Slator answer delegates questions

Shaman Stocker I have been playing sports most of my life and I like to think that this has helped me to develop my people and team leadership skills, and I've been captain of most of my teams. Like Sarah, I'm on various committees at the university. I'm running around like a headless chicken at times but I promise you, I am organised! I like to think I work well with people and I can talk to them without sounding disrespectful. I can also talk to people who perhaps need to work on their skills and help to bring them on.

Product wise I'm always eager to learn any new skills or techniques that come out, I'm like, do you know anything about this? Give me a one-to-one, teach me everything. So I like to learn new techniques. I like to think my products are quite high quality. I take a lot of time on them; I design them quite carefully and make sure down to the tiny detail they're perfect as much as I can. I like to think I'm quite a fun person but up to you I guess.

Sara Autton Fabulous, you're all hired. Terrific, that's really great and it's really great to see you're so enthusiastic about what you do and I hope you will be able to continue that enthusiasm right the way through your careers. Don't forget every day is a school day. I'm sure we are all still learning as we go, I certainly am. I always see something new every day and it's great. We have time for one more question if anybody has one?

Brian Ingles, Rondo Where do you guys see your futures? Do you see it in artisanal bakery or industrial bakery? And what is your view of artisanal versus industry

and what's the general view of your peers in the industry?

Sarah Clifton I think industrial and artisan are both just as important as each other; you can't really have one without the other. For myself, I'm not really sure. I would like to work in both areas of the industry before I fully decide which one I want to go in because I'm sure I can pick up a lot of very important skills from both sides and find which one I really want to go into.

Kieran Slator I'm a really hands-on person, I used to work in bread bakeries. So we were making 100/200 loaves a day at most, so it wasn't quite as high scale as some of the bakeries in the industry are producing, but having the opportunity to go and look around these large bakeries has given us a chance to see how important it is, to see mass production and how it can work for us. At the moment, I feel more that small scale is what's working for me but then you never know where you can be led to.

Shaman Stocker I have not had enough experience yet in mass and smaller production to make a judgement yet but I feel both have their own skills that are really valuable. With smaller bakeries you need to make sure your quality is high because it is handmade products and that's what customers are paying for really, and that personal level of service. I also feel that on a larger scale, you need to know what is required to make a large number of loaves of bread and other products to a consistent standard every day. I think that would be a really interesting thing to learn.

Sara Autton Some very good points indeed in the above answers.

Just before we wrap up, I would like to take this opportunity to plug the ABST (Alliance of Bakery Students and Trainees). If you've not visited the ABST website, please do so because on there is a tab called the Hire Me Scheme. It's part of the ABST website where students, such as these lovely people you've met this morning, are able to upload their CVs so you have the option of interviewing not just from the National Bakery School but from all of the bakery colleges who are members of the ABST. If you are looking for staff, if you are looking for interns, if you're looking to give people like this work experience, the ABST website is place to go: www.abst.org.uk. I do urge you to have a look and if you see any of these students in the future, please consider giving them a job. To our NBS students and Elaine and Devon, thank you very much for your attendance, your excellent video and your answers to the delegate's questions. It has been lovely having you, thank you very much. *Applause*

Paul Turner, Chairman BSB Thank you very much to all the speakers we have enjoyed so far at today's Conference and thank you Sara for your role as Session Chair, with special thanks for managing the students' presentation so well, which was particularly enjoyable.

At this point I would like to introduce Richard Hazeldine as Session Chair for the rest of the conference. Richard started his career in the baking industry with Associated British Foods over 30 years ago. Since then he has held a number of senior manufacturing and commercial roles in various areas of the bakery industry, including bread, biscuits, snacks and latterly, ingredients. Richard holds an MBA and is a Fellow of the Institute of Sales and Marketing Management. He is the National Sales Manager for Zeelandia Ltd and is responsible for commercial activities in the UK and Ireland.

Richard Hazeldine, Session Chair Thank you very much Paul for those warm words of introduction. It's now my pleasure to introduce the last paper before lunch, which is on Pain Paillasse Long Fermentation Breads by Christian Pelisson. Christian is newly promoted and is in charge of business development. He provided all the Pain Paillasse breads that we ate at the conference dinner last night and the Pain Paillasse breads that we will eat for lunch today. Without further ado I will hand over to Christian and he'll take it from there.

Pain Paillasse Long Fermentation Breads by Christian Pelisson, Head of Business Development

Good morning everybody. I'm really pleased and honoured to be here with you today. I'm always really impressed by the diversity and the expertise of the audience in all areas of the bakery sector. I would like to thank Paul for giving me this opportunity to present to you today what we call the jewel of Swiss bakery products. I'm sure he has enjoyed Pain Paillasse bread during his stays in Geneva and I hope by the end of this presentation you will know how to pronounce its name.

My talk will cover the following agenda:

Pain Paillasse

- Paillasse, the story behind the bread
- The product – a «Grand Cru» of Bread
- Win in the market - Local Adaption & Variations
- Proven Success Story – 20 Retail & Artisan Markets
- Marketing support – more than just a product

Basically, every country in Europe has a long tradition of baking, however basic and I would say simple industrial bread consumption is falling; it's declining nearly everywhere, as Emma told us in her presentation.

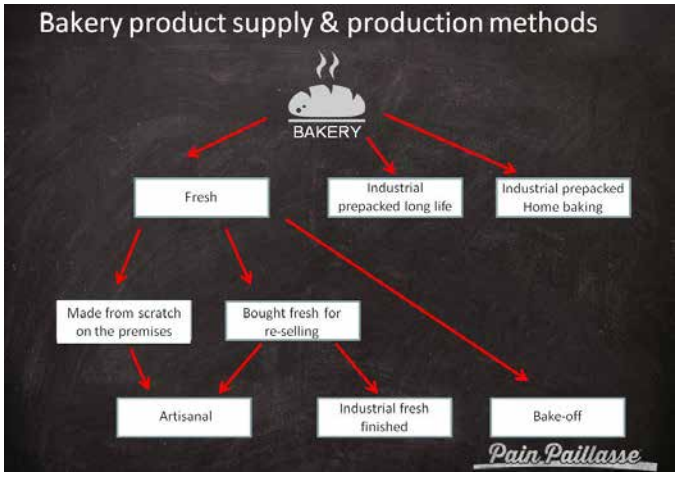
As you can see on the graph, Germany (DE) really dominates Europe in terms of bread consumption with 7.5 million tonnes and around a hundred kilo of bread per capita per year. It is a very mature and diversified market. There are still a large number of craft bakers, of craft bakers in Germany who have, I would say, a hundred points of sales/shops, so it's a bit different from other countries. The German craft bakers mostly use very traditional recipes based on mainly rye sourdough fermentation.

Then comes France with a little more than 4 million tonnes and France is still enjoying a pretty good network of craft

The bakery market in Europe for Bread, Viennoiserie, Patisserie & Savoury pastry

bakers, even though numbers have been declining since the 1990s, quite a dramatic decline in France. Most of the successful ways of producing and selling bread in France are through bakery chains and they are really gaining ground.

The UK and Italy are quite similar in terms of bread consumption. I speak about bread but with a big difference though. If I am not mistaken, about 80% of bread consumption in the UK is sliced and wrapped bread. In the UK white bread continues to see a significant decline, but maybe the value is increasing a little more. At the last autumn Conference, Matthew from Kantar spoke about bakery market trends and clearly defined the product categories that were down and those that were up. Today I'm going to tell about the category that is really gaining ground, speciality breads and among them, long fermentation breads.



Slide 3 sums up almost everything that can be offered to the final consumer in terms of bread type and production methods: scratch bakery products prepared and freshly baked using raw or semi-finished ingredients like mixes; you can buy in fresh finished bakery products from artisan or industrial bakers and resell them at your points of sale; bake-off, buying industrial semi-finished bake-off products to be baked off at the point of sale. As you will see, Pain Paillasse can be used in almost every category except packaged industrial bread.

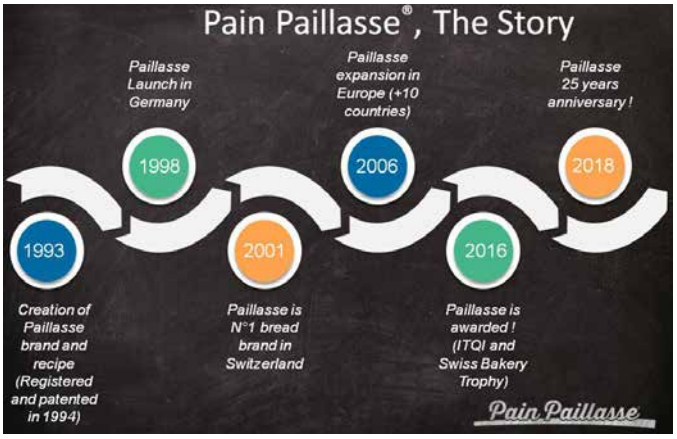
The popularity of speciality breads is driving growth in the bakery market worldwide and we are also experiencing a strong demand for healthier breads, clean label alternatives, low sugar and salt and more fibres. There is also a clear appeal for a holistic approach by the end consumer in food in general but bread in particular. Consumers want more information about the origin of the food they eat, the way it has been processed, the ingredients, and what impact it may have on their health, body and mind. Again, Pain Paillasse can offer all this.

Bakery trends

- The popularity of specialty breads is driving growth in the bakery markets worldwide
- Healthy alternative (clean label, low sugar, low salt, less yeast, more fibres…)
- Rustic aspect and slow baking (long, bulk fermentation, high hydration…)
- Ancient grain breads

Trends that are based on a true story show that consumers are really romanced by the stories products are telling you about their origins, the ingredients or inspiration. So the opportunity for bakery products to tap into more of a story telling and craft positioning is really significant. Many consumers are willing to pay more for higher quality bakery products. As I have already mentioned, overall consumption levels are declining in many countries, in many Western markets mainly, and the opportunity for producers to improve this quality positioning and escape from the pressure of price, is paramount.

So what is the story behind Paillasse bread? Aimé Pouly, a Swiss entrepreneur, founded the company in 1993. He was the prototype of a forward-thinking baker, being clever and passionate about his job and having a vision to link tradition with the adventure of his own company, while emphasising long-standing craft baking methods. The artesian entrepreneur built his success on arts and crafts, constantly orientated towards authenticity and quality.



Still today the original recipe remains unchanged and the Paillasse mother company still uses natural ingredients in most of its products and 24 hour fermentation. All Paillasse breads are baked fresh in real wood fired ovens. Paillasse is an entity within the group and has a production plant based in Geneva and around 60 shops.

In 1993 Aimé Pouly created the Paillasse bread recipe. He had been struggling with the organisation of his production and all the differences between the recipes he was using

for his bakery products. He was aiming at finding a flexible and very simple way of producing rustic and traditional bread. At this period of time, industrial bread was really booming and it was difficult to escape from this. I won't make any comments about the quality of the bread, it's just it was mass production and mass consumption of industrial breads. He wanted to go back to a more rustic and traditional bread at this time and so he patented a recipe for Paillasse and registered the brand in 1994. He started a licensing concept first in Switzerland and received quite a broad welcome among independent bakers. He was visiting them and asking if they were ready to make this bread and sell it under the name Paillasse, and he was pretty successful. As his business was really growing exponentially in Switzerland, he started to extend the concept, first in Germany and then in Austria and in France, and in the meantime Paillasse was awarded the status of being the number one brand in Switzerland. The rest is history, and now we are present in more than 20 countries in the world, and get more awards every year.

2018 will be the 25th year anniversary of Paillasse but sadly Aimé Pouly passed away in 2011. His company remained in the hands of the family and we have a new shareholder, his daughter Cindy Pouly, who is the main shareholder in the Pouly Group.

Paillasse success is mainly due to its imitable business aspect and customer service, and to the final product. Paillasse bread has a golden, crunchy crust, a light and open crumb, and thanks to its long fermentation process, analysts have been able to determine about 80 different aromas.

In order to achieve these particular characteristics, Paillasse licenced bakers need to blend our 100% natural concentrates with their domestic flour, carefully selected for the bake-ability and the flavour it brings to the end product. The Paillasse model is the same in every country. We supply the ingredients and the bakers use their domestic flour but we check the quality of the flour to ensure it is satisfactory. So industrially produced wheat breads are often made with a high concentration of yeast and the dough is fermented at a high temperature in order to decrease the production time. So bread is generally prepared out of essentially tasteless ingredients like flour, water, salt and yeast, almost the basic recipe would be like this and almost all flavour active components are formed during dough fermentation in baking.

Yeast used for bread manufacturing ferments the sugars, and I'm sure you all know this, present in the dough, converting them into carbon dioxide and ethanol as the main by products. So the intensity of the fermentation depends on the form of the yeast and the availability of fermentation sugars in the flour, including glucose, sucrose, maltose produced by the starch hydrolysis.

Fermentation influences product volume, shape, crust colour and crumb cell structure. Aroma and flavour level in the bread crumb has been found to be dependent on the yeast concentration but the mixing stage, fermentation time in process and baking techniques are very important to the final flavour of the bread.

Yeast and bacteria growth slows down or even stops at low temperatures. At 5˚C yeast will make higher amounts of some ester compounds that have a fruity and pleasant aroma. During sourdough based fermentation, a low (cool) temperature will favour ethanol fermentative bacteria and enhance the production of acetic acids which act as aroma enhancers and also mould inhibitors. In addition, ethanol fermentative bacteria also produce alcohols. Finally, long fermentation with a sourdough starter will increase the concentration of free amino acids which are quite important flavour precursors in the crust through the Maillard reaction with reducing sugars during baking.

The main drawback of long fermentation is the difficulty to build a starter powerful enough and consistent enough to prove the dough but still young enough to avoid too much sourness in the bread. I would say that sourness is a less consensual flavour among end consumers. Even though it's gaining a lot of consumers, they ask for a specific flavour coming from the sourdough fermentation, but in Western countries mainly, even though in Eastern countries they are really used to this rye, quite acidic sourdough, but what we call sourdough in Western countries is more like something lactic, something not too aggressive. Speaking about this strong sourdough taste, San Francisco sourdough and rye sourdough based bread, can be pretty intense and very acidic in flavour, so this kind of product is not part of my paper.

The patented Paillasse bread fermentation methods also involve a long and slow fermentation of the dough at two different temperatures but without the use of a sourdough. It's a pre-ferment based on yeast fermentation but without any use of sourdough starter. It has a less sour flavour, is more lactic, more pleasant on the palate, and a very light and open structure of the crumb. So when you are using this kind of technique, it's a bulk fermentation, it means that gluten from the flour formed during kneading starts to relax during the fermentation and become very extensible, to hold the carbon dioxide gas produced by the yeast and give the final bread a good crumb structure.

In the original recipe, you have to use 78-80% water based on flour weight in the process, so it will result in a soft and extensible dough. That's why we recommend the use of stress free lines and laminators to process the dough. The only thing you will have to do by hand is the final shaping of the dough pieces. At first it was for craft bakers but now we have four industrial bakers making Paillasse bread in Europe and 90% of the process is done by machine but the

rest is done by hand to obtain the kind of bread required, especially with the twist which is the specific shape of this bread. You can make other shapes of course, but this is how Aimé Pouly wanted his bread made.

An industrial process that has been adapted to produce Paillasse artisan bread

I was telling you about the industrial process and you will see some pictures from one of our customers in France who is doing a pretty good job with a typical laminating line. They make part-baked, frozen and they sell it to retail in France and in some other countries and it's really a big success for them.

Paillasse bread is very popular with craft bakers of course and now our main market with them is Switzerland, Germany, Austria and France, and a little bit in Italy too. As mentioned earlier, Paillasse bread can also be produced by industrial bakers. However, as with every producer of Paillasse bread, they are closely selected, trained by our technical team and we check randomly the quality of the bread they make. It is really important for us is to keep the Paillasse bread quality consistent.

A range of products made from Paillasse white dough.

From three basic concentrates, we have pre-mixes or concentrates with different dosages and one unique recipe. We have developed a large number of variations and from a single dough, you can make a lot of different products. Paillasse dough is so versatile that you can really let your imagination run free by adding extra ingredients like basil and tomato, pumpkin, olives, chilli and corn, as we were talking about spicy products. It's really from the main white dough that you can get these variations.

Then we have a Paillasse dark bread dough and again the other ingredients you can put in it for product variations are chestnuts, chia seeds and carrots, figs and nuts, and potatoes, see pictures.

The same applies to the Paillasse rustic bread mix, which is a blend with some seeds in it and it goes very well with fruit and nuts. It is really a way for you to develop a full range of different products but simplifying the recipe, see the pictures.

The approach of Aimé Pouly from the beginning was to have the possibility of endless product variations from each type of Paillasse dough - white, dark and rustic.

A range of products made from Paillasse dark dough.

Top left: bread with chocolate; Top right: Focaccia; bottom: Paillasse crusty breads used for sandwiches

One bread type that is popular in Switzerland is called Paillasse Choc and it's basically bread with chocolate in the centre, see picture, and it is doing very well. The kids are eating this bread after school and it's a big success.

Rustic bread at the top, with variations below from adding fruits left, and nuts, right

Again regarding variations, you can make excellent focaccia and pizzas from Paillasse white dough made initially for bread, because they are basically the same recipe. Pizza dough should be made with a long fermentation process, so the Paillasse white dough is ideal for it.

Salted snacks and seasonal bread are other example of products which can be produced from the Paillasse basic dough.

Salted snacks.

Seasonal breads produced from Paillasse basic dough.

I told you that Pain Paillasse is successfully developing in around 20 international markets. Our products are listed in some of the major retail companies, retail chains, and in 2016 a little more than 15 million Paillasse breads were sold, mainly through retail companies and craft bakers.

As you can see, in Italy we have a mix of craft bakers and retailers but mainly Eastern Europe is really successful with the retailers, and especially with the Tesco Finest range. We've just started with the Lantmännen Group but with the milling part, selling to craft bakers in the Nordic countries. Germany is still our number one country outside of Switzerland with craft bakers.

Several markets have had positive volume development for more than seven years. These are just ideas to show you that, for example, a farm in Hungary even had a display in a shop, Carrefour - they use the brand. Some of them don't really want to use the brand Paillasse but as it is a licensing concept, we try to convince them to convince their customers to use our brand, and in some cases it works pretty well, like in Spain with Eroski, who changed the name to Pain Paillasse, so this is acceptable, they don't have to keep the Pain but they used Pain Paillasse; the same in the US where we are trying to enter. In France we have several customers like Intermarche and Carrefour.

Since this is a licensing concept, we give technical support to train and follow the quality of the Paillasse breads that are being made by our customers. We also have to supply them with marketing support.

Pain Paillasse also benefits from the endorsement of some famous icons. Georges Blanc is a French 3-star Michelin chef and he started producing Pain Paillasse in the year 2000 and he's still producing it. He has a small bakery together with his 3-star restaurant and makes Pain Paillasse bread every day.

We have also won some awards, as you can see in the slide. Pain Paillasse white bread won two stars in 2016. The International Taste **&** Quality Institute (iTQi) competition in Belgium is a very important competition for international chefs and we have two awards for Paillasse bread. It is really mixing up the two worlds of chefs and bakers but I think it is very important for this quality of bread to be delivered and served at these pretty top range restaurants. Most of the time when you go to a good restaurant the bread is not as good at it should be. So we also work on this acceptance from the chefs that good bread has to be part of the meal and it is important for them to recognise the quality of our product. This year, in 2017, we won two awards with the Rustic, this one, the Diavolino, is a spicy version of Paillasse and they really liked it.

I was saying about some marketing tools, so maybe I don't know if it's really critical here but we write health claims; I don't know if the FSA would accept that. They are very basic actually. As I told you before, long fermentation breads can help the bakers catch up with re-sale consumption trends and these visuals in the picture are basically postcards that we give to the bakers and they can give it to their customers in the point of sales.

For example, the picture of the athlete is because Paillasse breads are higher in complex carbohydrates than standard white breads, slow releasing carbohydrates are recommended for long efforts and endurance training. A nutritionist helped us to produce them.

Three postcards that are given to customers to promote the health benefits of eating Paillasse breads.

We have a second card which promotes the high protein content in Paillasse bread. This helps you to feel full for longer after eating the bread and protein is essential for a healthy and balanced diet. Finally, the long fermentation process for Paillasse bread and the use of natural leavens, improves the degradation of phytic acids contained in the grain. This increases the bio availability of the minerals present in the flour, like zinc, magnesium and calcium, and they facilitate their absorption by the body, as well as improving the digestibility of these breads compared fast production breads.

The final slide gives you some examples of customer support. First of all, the branding is important for us and we have different branding for craft bakers and for industrial bakers, with Pain Paillasse included in both, although they are quite different. We have a very nice logo, red and yellow, that's the original one, so even though we improved it, it is still very traditional, and this one is mainly used by industrial bakers and for retail and food service.

In Switzerland, for example, and in Germany we supply a lot of recipes and marketing ideas. We adapt them to the culture of the country. We supply seasonal bread posters that customers can use in their point of sales. We have a Paillasse App, which is just in Switzerland at present. So if you go to Switzerland, you can just download it and then you will find out where you can find Paillasse bread, because every location is on the app. This is also a great tool for us to make some marketing actions and next year we're going to use it for a competition. Of course, we supply bread tags, bread bags and we have a website of course, but we're on Facebook and Instagram. So we try to communicate as much as possible with the younger generation, which is really important. That's about all from me Richard.

Richard Hazeldine Thank you Christian Have you any questions for Christian?

Question Sara Autton, ABST Thank you Christian, that was very interesting. You mentioned part of the process was a dual fermentation at different temperatures. Can you explain a little bit about why that happens?

Christian Pelisson It's 24 hour fermentation but we split it. Like I was saying, the cold fermentation brings very specific effects to the dough and then it's a very slow fermentation, and we have a second fermentation of 12 hours at different temperatures but that brings all the volume and more aromas to the dough. We also start with a pre-ferment of four / five hours, so it's a combination of these three techniques that makes it different.

Question Brian Clarke You're selling the brand, the concentrate and the production process. The process, from what I picked up, is not dissimilar to the way you would make a 24 hour ferment for the production of ciabattas. I know this because I used to make a lot of ciabattas when working for a company that supplied most of the major retailers and we used a cold 18-20 hours ferment and then we would go on to a second stage fermentation at a higher temperature.

Christian Pelisson How long was the second fermentation?

Brian Clarke The second fermentation would be about an hour.

Christian Pelisson Yes, you put on the line, you laminate, divide and then from the time it goes to the oven…

Brian Clarke Yes, it's a similar open texture to yours, so it's interesting to understand what you would sell to the UK market if you were trying to get into that area.

Christian Pelisson I didn't mention in the presentation but we have developed another concentrate for a much shorter fermentation at five hours, but still bulk fermentation but one temperature for five hours and then it goes on the line direct to the oven. We get a similar result in terms of flavour, mainly there is a lack of flavour compared to the original recipe of course, but still it is quite an interesting product. I think the two stages are quite important for this bulk fermentation. The cold fermentation you know about it but then the second one is quite critical too, and it brings a lot more aromas. If you take the dough outside the fridge after 12 hours, you won't get enough volume, so you need to ferment it again, and these 12 hours more are really helping the dough to develop but, like you say, if you make ciabatta I suppose you put a lot of water also, but at the end of the day, you need something that the machine can handle and at the end get a good product with a full flavour.

Question, Jim Brown Can you tell us what process has been used for the Paillasse rolls we're going to be eating at lunchtime?

Christian Pelisson The original 24 hour process. The baker who produced these rolls is a new customer in the UK, a craft baker in Maidenhead. He has a small bakery café and helped me with supplying the rolls for the conference. He's not used to producing 400 bread rolls per day but he did using the original recipe.

Jim Brown What type of equipment does he have, is it fairly small scale?

Christian Pelisson Yes it is production by hand in a very small bakery, but he's using a deck oven, which is something we prefer to the convection oven.

Mike Bagshaw, Newbury I think it's really commendable that you have a branded ingredient offering that you've obviously got loyalty to if you look at what you're doing. That's very hard to do. There have been lots of brands and ingredients that people have tried and it's very hard to attach a brand and loyalty to an ingredient system. I know that from my own personal experience. The question I have is how do you protect it, because surely people will look at that product and try and produce their own version?

Christian Pelisson The process is patented so if you do exactly the same process, we could attack you! But my main job is to find new customers, not to attack the other ones. It's true that it's difficult to protect it, of course, and you can find on the market some copies of this bread. I'm not saying that it's the best bread on Earth; I'm just saying that it's a good recipe. It's patented, the brand is registered and once you enter the licensing concept, you have exclusivity on the product too; like in the Czech Republic, for example, we work with one customer only. We have one producer of Paillasse in the Czech Republic. It's an industrial producer but he's supplying, like I showed you, the main retailers in the Czech Republic and we're happy with it. He's working with us. He has some competition of course. The shape is quite important. We want at least that one of his products is twisted, but otherwise he can make balls, he can make ciabattas made out of this Paillasse dough. So it's not really licensing an ingredient, it's more like a concept, and then when it comes to the ingredient, the exclusivity gives some added value to the concept, because otherwise if you go to other companies like they all have ingredients to make specific recipes, but if you are in a street with ten bakers, they could do exactly the same bread using exactly the same ingredients but only one could do the Paillasse bread with our ingredients, that's the thing. The territorial exclusivity is really important in the whole concept.

Richard Hazeldine, Session Chair Thank you Christian, that was very interesting. *Applause*

Maintaining Progress in a Champion Bakery by Gordon McGhee, MD, D McGhee & Sons, Glasgow

Richard Hazeldine, Session Chair We're now going to continue our global theme by going north of the border to Scotland and Gordon McGhee is going to tell us what it takes to maintain progress in a champion bakery. I know that what he says will be very enlightening and that you will feel the justifiable pride he has for McGhee's Bakery. The company was founded in 1936, moved to a new bakery in 1969 and then to a further new bakery in 2004, since when they have expanded considerably in their production capability and capacity, and in their range of products and customers. They won Scottish Baker of the Year in 2016. I will hand you over to Gordon now to expand on the above.

Making Progress in a Champion Bakery by Gordon McGhee

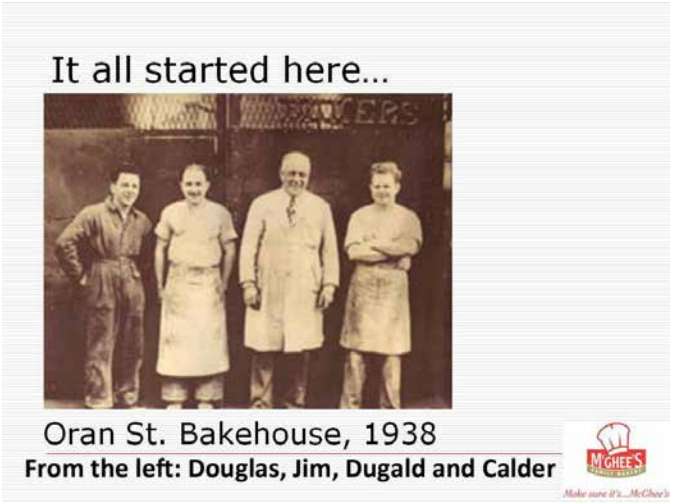
Good afternoon ladies and gentlemen. Looking around the room at all the people here today I really feel quite humble to be invited to speak to you about our Glasgow-based family business, which, by the way, recently crept into the Top 100 best performing family businesses in Scotland! I thought, in a moment of panic, Jeez, I'm going to have to make this interesting! Maybe even ***funny!***

Earlier this year, I was listening intently to a very knowledgeable speaker. He was a bit mundane, but certainly sounded knowledgeable. But he ***really*** got my attention, when he paused, raised his voice a bit, and picked out someone in the front row and said, "Excuse me sir, your colleague seems to have fallen asleep during my talk. Would you mind waking him up please?" The man in the audience replied, "You put him to sleep. You wake him up!" ***Hopefully*** I won't have to be asking any of you to give your colleague a nudge this afternoon!

As Richard mentioned in his very generous introduction, my name is Gordon McGhee and I'm Group Managing Director of what's now the third generation family business, the McGhee Group. I want to give you some insight into what we've done with what is now a substantial family business, how we overcame some very significant challenges and ultimately, how we made a plan, stuck to the plan, modified the plan and stuck to the plan again, until we began to see, by any measure, the sort of business successes that resulted in us becoming, as Richard mentioned earlier, a Champion Bakery business.

First though, I'm going to show you a two and a half minute video that describes our business as it is today. (*An excellent video clip was shown, which received generous applause*)

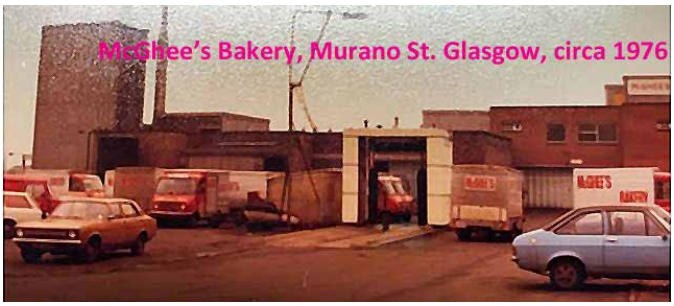
Our business is 82 years old this year and we've just made the transition from being an SME, something we strived to stay for quite some time, because as you know, you can access a larger slice of the grant pie as an SME, to a large manufacturing business. Things change a bit when you become a large company, employing more than 250 people. Our turnover has grown to over £30 million and profits have remained strong despite fierce rises in ingredients and other costs.



This is a picture from 1938, of my grandfather, Dugald McGhee, second from right, with my father Calder on his right and my uncles Douglas and Jim on his left. They are

standing outside the Bakehouse, our first bakery site in Oran Street, Glasgow.

My father, Calder oversaw the move to a much bigger site at Murano Street, Glasgow in 1976, slide 2.



He introduced what were at the time, new efficient working practices throughout our 24,000 square foot site.

He also made sure we had a well-equipped maintenance and engineering facility that meant we could do all our own vehicle servicing and machine repair and maintenance on one site, eliminating the need for any outside help.

Delivery vans & bakery equipment service and repair shops

Even then we had an apprenticeship scheme in place and in the picture below the young lad on the left is now in his 50s and is one of our bakery shift managers.

The apprentice on the left is now a shift manager

When I took over as M.D. of McGhee's in 1998, I had a constant eye on developing the business, creating something to be proud of, and yes, making ***my*** mark on the McGhee's Bakery history timeline! I ***knew,*** there was ***more*** that could be done. I ***knew*** that if we could keep the costs low and the quality high, we could have a shot at tapping into the very large markets in Glasgow, outside Glasgow, across Scotland and beyond.

This wasn't just some sort of wishful thinking – I was ***determined*** to do it. I therefore enrolled in an MBA course, completed it successfully and graduated two years later, with a ***Plan.*** The real motive for ***me*** getting my MBA was to get credibility with the bank, which might have seen us as another 3rd generation lot, taking on the family business and potentially blowing the crown jewels! The plan was to build a new bakery and get the efficiencies in place to be a high-volume, low cost manufacturer. ***Then,*** to go out and get the business required to fill the new efficient bakery facility. It was a plan with crystal-clear definition – and it was clear to everyone, because it was in my head! As I've said, we are a family business run by three of us, my brother Ian as Production Director, my cousin Stuart as Sales Director, and me at the helm as M.D.

Gordon, Ian & Stuart McGhee

We knew we had the makings of being a successful ***big*** business, and in about 1999, we engaged some "experts" from Glasgow University for advice. They were very thorough, and very honest. They said we needed to grow the people to grow the business. They told us, we had to trust ***others*** to do what we only trusted ***ourselves*** to do. And of course ladies and gentlemen, we said, "Aye, right……."

In fact the picture below shows another of our 'apprentice to shift manager' stories, a very happy Veronika receiving her well-earned NVQ certificate from her shift manager Raymond Templeton, who started with us as an apprentice.

Going back to our plan, in very short order, only six years, we took the necessary steps to broaden the leadership load and made the biggest decision in our history. We sold the site we were on and prepared everything to acquire ***another*** bakery business in Glasgow, along with their very substantial land area. Sadly however, ***that*** didn't work out! The due-diligence, diligently carried out by our very smartly dressed accountants, revealed that the deal was not quite as viable as we thought it was and it was cancelled. However we had to get out of our existing bakery in less than a year because we'd already ***sold*** our land and bakery for ***housing development and had the exit date looming!*** We therefore needed to be ready to start manufacturing operations again somewhere else, in less than a year.

Have you ever seen that film, "Cool Runnings" – about a Jamaican bobsleigh team? Although they weren't bobsleigh runners, a group of Jamaican guys decided to enter the ***winter*** Olympics as a bobsleigh team! Everyone said, "It can't be done", but they were determined, they

were focused, and they made it! Well, we felt a bit like that bobsleigh team!

We worked fast, ***very*** fast, (one of the benefits of being a family business) and secured a new brown-field site within the M8 Food Park on the outskirts of Glasgow. We opened the doors to our new bakery facility In August 2005, without losing one day's production and fulfilling ***every*** customer order into the bargain.

Twelve years later, after investing over £23 million in extensions, plant and equipment, we finished our ***final*** expansion earlier this year, adding another 25% capacity and allowing us to confidently bid for the significantly higher volume, lower margin business I knew we were capable of securing and producing.

Earlier this year, I was reminded of our commitment to widen that leadership, trust other people to do what I know I'm the best at! It had been over 15 years but I finally got the message. I began to focus my efforts on getting the best out of others, delegating and yes, trusting others to do an outstanding job.

The McGhees management team

They know they can never be quite as outstanding as me of course – I know this because they keep telling me I'm the best… I wonder…?

So, while I trusted others to do an outstanding job, I could get back to focusing on ***that plan!*** And the plan was to build the bakery and get efficiencies in every aspect of what we do. That meant tracing the footsteps of every product and production line and designing the best position for everything in our new factory. ***Then and only then,*** *would we* go out and get the business to fill the factory.

A big task for my brother Ian and me at that time was to travel all over Europe searching for the very best equipment that would enable us to have the manufacturing efficiencies we were after. While this was a big and time consuming task, it was a lot of fun at times as well!

Looking for bakery equipment in Germany is thirsty work!

For McGhee's, the local market became the local market in areas ***all over*** Scotland, as we grew by acquisition. From Kilmarnock in South West Scotland, to Dundee and Aberdeen in the North East, we acquired local bakery names and through a mix of centralised but bespoke production, as well as local production, began to capture market share across the country.

Over a ten year period, we acquired 9 businesses around the country. We closed, moved or re-designed production at each of these sites, to fit with our production and logistics processes. This gave us the basis of Centralised production sites, feeding localised distribution hubs around the country, which is our geographical solution to satisfying local markets and national accounts today.

The above growth by brand acquisition was ***part*** of the plan. The ***actual*** plan though, came from those ideas developed while I was doing an MBA, almost 25 years ago now. I had put my best efforts into an essay project, based on our industry, describing in some detail how a bakery such as ours might succeed by developing the efficiencies to become a high-volume, low cost manufacturer. The ***essence*** of this plan really came to fruition when we completed our most recent extension to our manufacturing facilities at our headquarters site in Glasgow.

We were now in ***pole position*** to offer a credible high volume production capability to the main supermarket chains, with proven reliability of supply. We are filling our newly-expanded site in Glasgow with that high-volume, ***decent*** margin, business. So we had a ***plan***, firstly in

my head, then in the minds of the rest of the senior management team, and we ***executed*** the plan.

Never forget, that although ***we all*** feel the constant pressure to sell ourselves, and to win business, the buyer on the other hand has pressures too. ***Everyone*** is depending on them to secure the supplier deals that will ensure ***they*** have a constant, and above all, ***reliable*** supply of product into their locations across the country to keep their shelves filled. Our ***plan***, originally worked on ***25 years ago,*** gave them just that. So as I've said, we had a plan, and we executed the plan. That's meant ***relentlessly*** focusing on our plan to have the efficiencies of operations to produce a high quality product our customers would buy in high numbers. But what ***is high quality?*** What do those words mean?

Let's look at the ***definition*** of quality. Anyone here want to tell me the words that define what we mean by quality? Well my definition of quality, the one I feel passionately about, is this:

Quality = Conformance to Customer Requirements. That's it, nothing more than that.


Traditional confectionery products

So what do ***our*** customers want and ***who*** are our customers? Well our plan was to be a successful high-volume and low-cost producer. So our customers were ***never*** going to be at the top of the pyramid – the likes of Gleneagles Hotel, Jamie Oliver restaurants, or Claridge's in London. No, our sights were firmly set on the lower end of the pyramid, the ***wider*** end!

Customer requirements at the wider end of the pyramid often demand a product that's traditional, widely available, from corner shops to supermarkets, and is either seen as a convenience or an impulse purchase. So if the price isn't right, or if it looks too up-market (or high quality as some might put it!), ***the customer just won't buy it!*** So when ***anyone*** asks one of my team or me about the quality of our products, we reply with enthusiasm, ***"Our product quality is brilliant!"***

What we've achieved as a management team over the past 5 years, has been pretty impressive, even if I say so myself. Awards include Scottish Baker of the Year 2015/16; best ***Family*** Business in 2016; and for one of our satellite bakeries, Kerrs in Lanarkshire, Best SME Business 2017. In fact I think we're going to have to build a new trophy cabinet soon!

Ian and Gordon receive Scottish Bakers 2015 Baker of the Year Award

Share of business Looking back now, before we made the move to our current site 12 years ago, we found ourselves in the position of having one large supermarket accounting for 35% of our capacity. As we made the move to our ***new*** site we took the decision to walk away from that business, dropping our turnover significantly at a stroke. Despite many difficult conversations with the banks and others, we knew fundamentally we needed a ***balanced*** business, with manufacturing efficiencies and processes that would enable us to compete with the ***best,*** for ***any*** baked morning goods in the high-volume, low cost areas of the market. Twelve years on we're now supplying ***most*** of the main supermarket chains, with the largest sales representing 8% of our weekly turnover. So we are sticking to the plan, which includes never having any one customer accounting for more than 10% of our business. So what are these famous high-volume, low cost products I've been talking about? Our signature product, the one we're most famous for, are crispy rolls. Between them and our other roll products, we produce over three million per week – they're very ***typical*** products in Scotland, as opposed to bread in England.


Stress-free cutting line for crispy roll dough pieces

The manufacturing process for crispy rolls involves:

Stage one – mixing the dough in our temperature controlled Sancassiano Global Force spiral mixers, with bottom-door discharge from our mezzanine level, allowing us to use the force of gravity to drop the batches of dough into containers on the ground floor.

Stage two - the dough is bulk fermented for three hours and then goes through our stress-free cutting lines to produce the individual dough pieces and transfer them to trays. This is followed by an 8 hour final proof.

McGhee's crispy rolls are baked to perfection

Stage three - the fully proved dough pieces are now ready for the oven and it's a 21 minute bake. After baking we use vacuum coolers on a four minute cycle to cool the crispy rolls ready for packing.

Our number two product by volume is potato scones, which are part of the staple diet of many people in Scotland! We produce 300,000 packets of potato scones per week, representing over 80 tonnes of product. Potato scones have been our fastest growing product the past 3 years.

Automatic high output potato scone line

Traditionally potato scones are eaten at breakfast in Scotland. However more and more people are now using them as a lunch alternative as well. Grilled and spread with butter and topped with beans and cheese.

The production process for potato scones is basically very simple for us. We have two mixers supplying three travelling hotplates. The dough is made from potato flakes and metered water and oil in the first mix. Some flour and a sachet of special ingredients are then added and mixing is completed. The dough is then transferred by conveyor to the hopper of the sheeting equipment.

We have three hotplates, each producing 1000 packets of potato scones per hour. The dough is sheeted, cut to the potato scone shape required, with full scrap return to the sheeting hopper. The potato scones are automatically laid on the travelling hotplate and baked both sides, with automatic turning. After baking they are transferred to spiral coolers and then to our packing lines, which can be set to any packaging configuration, depending on the customer's needs. The labour content of potato scones is in the order of 8%, depending on the selling price.

As a result of all the growth discussed above, we've seen a reduction in confectionery as a percentage of our production, although doughnuts as a SKU, are now growing in volume. But, remember that plan? The one about developing a high-volume, low cost production business? Well, we needed ***another*** plan. A ***second*** plan, of which more later!

Short product shelf life Because all our high volume products are ***morning*** goods, often with one day shelf-life, our distribution and logistics business had to be developed

to be super-efficient and reliable. We have 75 delivery vans, each delivering up to 70 drops a night. If even a ***small percentage***, of those deliveries were ***wrong,*** we'd have the customers on the phone so fast our business would be stopped in its tracks. So in many ways, we're ***two*** businesses, one production, and one logistics. ***Both*** have to work in the most efficient way possible. ***Both*** have to be up to the minute in technology and customer-focus. Logistics has even become part of our ***brand image.***

We've stuck to a decision we made a few years ago to run a fleet of our own vehicles, under warranty and dispensed with after 3 years. Yes, some have said, why not keep the vehicles longer, why not rent them etc. but it's part of our image, the image the customers see every day, the gleaming delivery van, driven carefully by someone in our McGhee's clothing, who cares about his or her job and cares about the service they give to their customers.

To keep pace as we continue to grow profitable sales in line with our plan, we've worked more and more on developing our brand. We now have an advertising and marketing budget and we use local radio and social media extensively to engage with our target customers.

Our three central manufacturing hubs now feed our local distribution hubs with locally branded products, produced specifically for that part of the country. Local products are important. For example don't try selling a Glasgow roll in Edinburgh or an Aberdeen Buttery in the Borders!

So, did we get lucky? Did it happen by chance? No, we've worked hard, all of us and we've got up again more often than we've fallen down. In the end we put into action what was written in that MBA dissertation 25 years ago. We ***understood*** what it would take to stay in business, having a deliberate strategy to target the widest end of the customer pyramid.

So is that the end of the story? We ***have*** after all, got the bakery to an efficiency level most companies would strive for; we ***have*** a handle on what it takes to get the ***logistics*** right, 24/7; and we've ***hired*** the staff we need in all the key positions in the business. No, it's not the end of the story, not by a ***long*** way!

Now, because the world around us is changing constantly, customers expect ever more, in every possible way, things to make their lives easier and more convenient, so we're off again, on ***another*** plan!

Mich Turner inspired doughnuts and packaging

We've engaged the T.V. superstar Mich Turner to help us and with her input and ideas, coupled with our ability to produce, we've updated our whole product range, added premium packaging, in order to target higher end markets, and we have put real time and money into our marketing and promotional activities. It means that even ***I have*** **had** to learn about social media, about clicks per ad, and about managing channels to market, and even how to answer questions in T.V. and radio interviews! So no, we're not finished, we're still up for the fight and we're still doing whatever it takes to stay ahead of the game!

There are the three family members in the senior team, Gordon and Ian on the left of the picture Stuart on the right, and alongside us, not all shown, are five others, all with their own particular skills and areas of expertise that enable us to make the "good ideas" work in real life!

As you all know, it takes all sorts of personalities as well as skills to make a great team work. We've learned the difference between "creativity", and "innovation" – creativity is having the ideas – innovation is putting them into action and our team is all about action! As a result of our efforts, the £130k a week sales of 12 years ago has become £600k a week now. We have ***become*** the exemplar bakery business, producing high quality morning goods in high volume at low cost and believe it or not ***profitably.***

A management group meeting

Richard Hazeldine, Session Chair Thank you very much Gordon for that very interesting presentation. It's good to have a good-news story these days. We've got a few minutes if there any questions.

Craig McPhie, President, Scottish Bakers That was great Gordon, good to hear. You've obviously had some low points but luckily had many more high points. What would you say was the pivotal point for yourself, when you knew that you had cracked it and there was now going to be more high points for the future and the future was now looking bright?

Gordon McGhee There were quite a few of these pivotal points Craig but two in particular.

My father retired out of the business at the fairly early age, 58 I think he was. He stood back and let me get on with the production side of it. The business was then controlled by my uncle Gavin but he sadly died unexpectedly. While this was very sad indeed for Gavin's family and for everyone at McGhees, it ultimately allowed me to move things along more swiftly. So that was a key point in the business but we fast came into the commercial world. At that time we had a £750,000 unsecured overdraft and when the bank heard that Gavin had died I got a call from them asking us to pay off the overdraft! So that was a pivotal point.

As I said in my presentation, when we sold the Murano Street site we thought were going to take over our main competitor in Glasgow. When the takeover deal fell through that really floored us. It was just at the peak of the property prices and the market in Glasgow was pretty buoyant. We had managed to sell our bakery site for £3.8 million. We thought, do we keep the money or do we continue in business? Being bakers and loving what we do, we decided to throw the lot in the pot and start again and as you heard, that is what we did. The only problem was that it cost about £8 million to build and equip the new bakery, so that was another large mountain to climb. Those are the two key pivotal points.

Craig McPhie You are obviously not frightened of the challenges Gordon, so well done to you, Ian and Stuart, your management team and all your staff.

Robin Jones, Village Bakery Gordon a great story and well done. What happened to your competitor?

Gordon McGhee Well, believe it or not, they went into administration. KPMG, I think it was, was dealing with the administration process and they would not sell us the business. We actually offered the most money for it but the previous shareholders would not allow us to obtain the business because they felt we were going to get it too cheaply. They ended up selling the business to another group of people, which we were not happy about. Anyway it happened and it was a long time ago. At that time our competitor was turning over £11 million and I think we were around £10 million. They're still turning over £11 million and we're on £30 million, so you just wonder sometimes about the decisions people make!

Ronnie Miles, Vice President, Scottish Bakers Gordon, we had some students speaking to us earlier today, all talented young individuals. Given you've suffered some hard times as well as good times, what one piece of advice would you give to these young students that you wished you'd been given?

Gordon McGhee Certainly getting opportunities to have work placements is really good and allowing them to show the skills that they have, and they clearly have skills because they were super kids and they talked really well. I think that kind of situation is good for them just to show what their capabilities are and to learn something about commercial baking. I'm sure we will interview a few of them.

Question Your big chance came when your uncle died. When the time comes, how would you hand on the family business to the next generation?

Gordon McGhee We have an eye on the succession situation and we've been kicking away at it for probably five years. We've recently engaged KPMG to do succession planning with us. They are going through the process of interviewing the three of us as directors. They will then interview our wives to get their perspective on things without us present. Then they're going to interview our children, the fourth generation. There are five children in total and I currently couldn't tell you whether or not any of them wants to come into business.

I have two daughters and they're quite successful in what they're doing career wise, so the chances of them coming in to the business are slim. My brother Ian has three kids and they're too young yet to make that decision. I think what we're going to do is put a five year time span from now for our kids to step up to the mark and say if they want to come into the business. It's a big decision for them, because it's more and more about life balance between work and leisure today. We seem to work, work, work but the kids want a good balance between the amount of time they work and the amount of time they are away from work.

Richard Hazeldine, Session Chair Thank you very much Gordon for an excellent paper. *Applause*

Richard Hazeldine, Session Chair

We're now going to move on to our final speaker of the day, Lena Hamann of DuPont, who is also from Switzerland. Lena is going to tell us about some of the product and consumer information they use to determine their marketing campaigns and how they obtain this information. She will use examples from consumer studies they recently carried out on gluten-free bakery products.

Insights into the Real Gluten-free Needs and Expectations of UK consumers by Anna-Lena Hamann, Dupont Health & Nutrition

Good afternoon everyone. Thank you very much for giving me this opportunity to present to you the needs and expectations of UK consumers when it comes to gluten-free bakery products. The reason for picking this topic is that we recently completed a consumer study on gluten-free and we are now building a campaign around it. I also thought it would be interesting for you to gain some insights around how we, as an ingredient supplier, approach innovation and campaigns. Fresh from the press this morning from Emma's presentation, no-one

has yet seen these results from the UK consumer study so I'm also interested in hearing your thoughts and what you think about it.

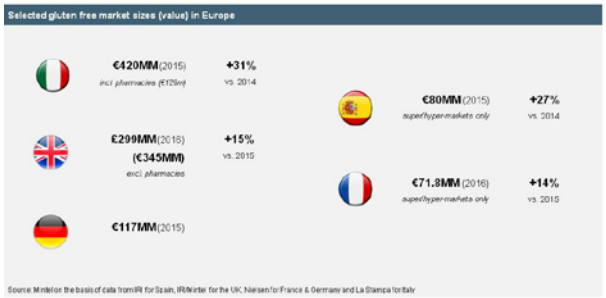
When we start looking at a new topic for a consumer survey we of course look at the market. I think we've all now realised that the European bakery market is expected to be flat in the coming years in volume terms. For the two graphs in slide 1, I picked the five biggest Western European countries - Spain, UK, France, Italy and Germany. On the left graph you see the average annual growth rate, 2016-2021 in volume terms, and on the right is the same but in value terms.

Slide 1 The European bakery market is expected to be flat in volume in the coming years and to show only slow growth in value terms

What we can see in volume terms is a contraction of the market in the UK, France and Germany and a slight growth in Spain and Italy but overall if we look at Europe in volume terms, the market is expected to be flat. The value overall for Europe is around 4% growth year-on-year. It's lower in the big European markets, so no surprise here, I think we're all aligned as we have seen throughout the entire day.

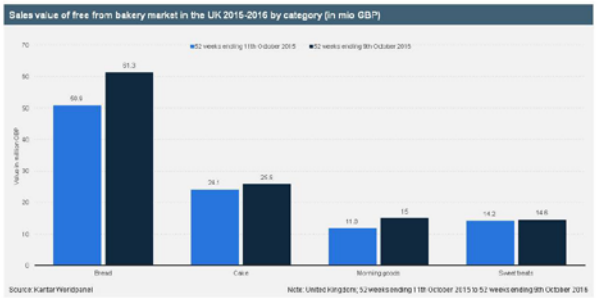
The good news, slide 2, is that there are pockets of growth, and gluten-free is one of them. You see the gluten-free market sizes for these different countries for 2015 or 2016 depending on the data I could find, plus the yearly growth rate. So Italy and Spain almost 30% growth, then the UK 15% France at 14% growth. So that's quite significant and those numbers are also quite significant if you remember the numbers that Emma presented in her paper. For Germany I didn't have the exact figure but I know that it's a double-digit growth number, so overall gluten-free is one of the pockets of growth that we still see in bakery.

Slide 2 Good news is that pockets of growth exist and gluten free is one of them



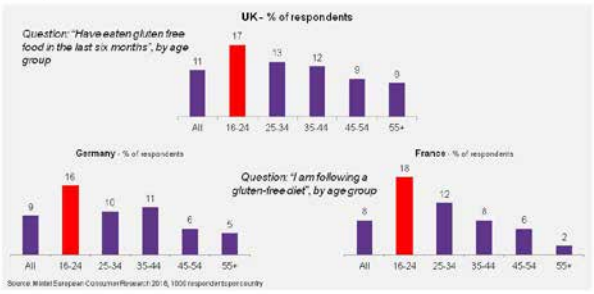
If we now look at the UK market, slide 3, we see that bread is not only the biggest category, and that probably is not really a surprise, but it's also the second fastest in terms of growth, right after morning goods. What do I mean by morning goods? That's basically pastries, so croissants, English muffins and those kinds of products. So morning goods 2015/2016 they've been growing by 27% and bread by 20%, so again that's quite significant to have these kinds of numbers.

Slide 3 In the free from bakery market in the UK, bread is not only the largest category in terms of sales but also displays double digit growth along with morning goods



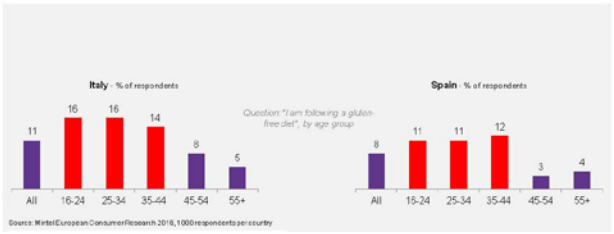
Who are the gluten-free consumers, slide 4? Here what we see is that they are most likely to be young millennials, 16-24 year old, and this is the case for the UK, France and Germany. You see that between 16% and 18% of millennials in these three countries say that they regularly eat gluten-free products. Just to compare these numbers with the population overall, here we have Germany a bit less than 10%, the same for France, but above 10% in the UK. So it's definitely the young millennials that are the target group, the driver behind the trend.

Slide 4 Gluten-free dieters are most likely to be young Millennials (16-24 year olds)...



Interestingly, if we look at Italy and Spain, slide 5, because I always look at these five countries, the spread is a bit wider. So here it's always the 16 to let's say 44 year olds that are more attracted to gluten-free products. One of the assumptions here is that gluten-free products have been around for longer in these two markets and so that could be the reason for the wider spread of consumer age.

Slide 5 ...although Italy and Spain show a wider spread across 16-44 year olds

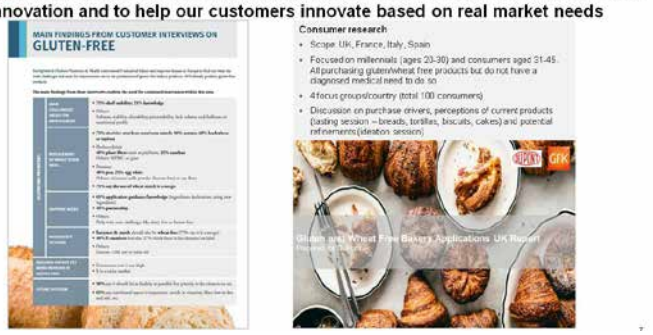


The above was a quick snapshot of the market. After we have analysed the market, typically the next steps we take are that we ask our customers and consumers what are their challenges and their needs regarding gluten free.

In the 'main findings from customer interviews' document in slide 6 we have asked a number of our customers what the challenges and the needs they have in the production of gluten-free products? What support do you need? What are the ingredients you mostly use or want to use for the production of gluten free products? What are your

future concerns? These are the type of questions we ask. From the replies we then consolidate the findings, and here we made also a little handout of them. This then forms part of the basis of the innovation work we do to meet our customers' needs.

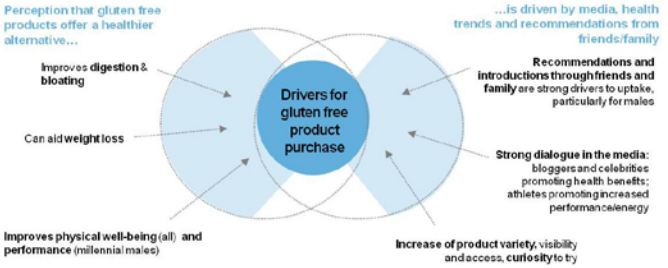
Slide 6 Structured VOC and tailored consumer studies are critical to enable N&H innovation and to help our customers innovate based on real market needs



The second part our survey is to find out what consumers want and we ask consumers similar questions. We therefore commissioned a consumer study by GFK, see slide 6. It was a qualitative research study that they conducted over the spring and summer this year in four countries: the UK, France, Italy and Spain. They organised four focus groups by country and they interviewed millennials from 20-30 years old and older consumers from 31-45 year olds. We always had two women groups and two men groups. Typically the kind of questions we asked were: Why do you eat gluten-free products? What products are still missing in the market? We gave them GF products that exist on the market for them to taste and evaluate. So today I want to show you some of the main findings from the UK study, slide 7.

First of all we wanted to know why they choose gluten-free foods and it is no surprise that the perception is that gluten-free products are a healthier option to standard foods. Drivers for gluten free consumption were: it improves digestion and makes you feel less bloated; can aid weight loss; improves physical well being and performance.

Slide 7 Positive health associations, along with recommendations by friends and family, are the principal drivers for initial purchase of gluten free products



Then how did they get to know about gluten-free foods and what made them decide to add it to their diet? The three main drivers, slide 7, were: recommendations from family and friends; the media, articles, Instagram, blogs, TV shows, celebrities promoting the health benefits; availability, these products are just more and more visible and available in the supermarkets nowadays, with an increase in varieties, and also in restaurants and cafes. So now it's really difficult not to be aware of gluten-free products, which encourages more people to try them.

Gaps in market While the current offer for gluten free products is seen to have improved over the last few years, there are still gaps in the market as follows

a) While quality has improved with increasing demand, gluten free alternatives often **fall short on taste** and **texture** when compared to standard products.

b) More variety is required:
   - More **flavours** e.g. cheese bread
   - More **sizes** to suit different appetites and household needs
   - More **variants** and **wider accessibility** (ready-made gluten free sandwiches, options at cafés and restaurants)

c) Healthier lifestyle needs
   - Purchase driver: **'healthier' lifestyle**
   - However, perception that GF products contain **more sugar or unnatural ingredients** (opposes idea of healthier lifestyle)
   - Options which deliver on **quality taste** and **with healthier ingredients** are desired

The last point, healthier lifestyle is important. I mentioned before that consumers who eat gluten-free foods are looking for healthier alternatives to standard food. So an area that is still missing is making these gluten-free products healthier. Consumers are looking for an improved nutritional profile as well and specifically mentioned was less fat and less sugar. The above was a kind of in-general look at things and now I'm going to go into a bit more detail about what consumers were asked to do, slide 8.

Slide 8 We tested 5 gluten free products, all commercially available in the UK, from 4 different producers

They were asked to taste and evaluate five gluten free products, all available in the UK from four different producers: white bread; brown bread; a wrap; sandwich thins; and a muffin. They were given these products one after the other without the packaging, because we wanted to get their feedback, slide 9, on each product without the influence of the packaging. So there was no influence on the consumer from the brand, the label, or any product claims.

Slide 9 The muffin, brown bread & sandwich thins appealed the most to UK consumers

The muffin was particularly enjoyed by millennial males, and was ranked highly for taste, purchase intent and appearance**.** The brown bread was the preferred product among millennial males and older females. The tortilla wrap ranked highest on appearance, but failed on taste. The white bread appealed the most visually.

Question from a delegate Were the people in the taste panel current GF consumers?

Anna-Lena Hamann They were all people who regularly eat gluten-free products but don't have a medical need to do so. They can eat products which are gluten free and products which contain gluten. One of the complaints of gluten free consumers is that when they go out with friends for a meal, it is not that easy to continue their gluten-free diet.

Further Question When you looked at how many people in each country were choosing gluten-free products, did you break that down into how many of them needed to be gluten-free because they were coeliacs and how many of them were gluten free as a lifestyle choice?

Anna-Lena Hamann No, we didn't make that separation. So those consumer comments that I was showing beforehand were from people who chose gluten free as a lifestyle choice. The people who are coeliac are only 1% - 2% of the population.

Further Question When it came to gluten, would you say that they are avoiding wheat as well, and associated the two as the same thing?

Anna-Lena Hamann A very good point. We initially asked the wheat free question but the answers we got were not as clear as the answers on gluten free. So we decided to focus on gluten-free because when we asked about wheat-free, there was a lot of confusion with the answers. So we just captured the wheat free answers as feedback. If we want to do further research on wheat free we will probably phrase the questions differently. Very typically, people who eat gluten-free products are assured by the gluten-free claim and when asked if they would be similarly assured by a wheat free claim, they said no, they wouldn't be assured.

Comment I only asked the last question because some products are marketed as gluten-free and some products are marketed, deliberately as far as I can see, as gluten-free and wheat-free, so some manufacturers are making that link even if the consumer isn't.

Anna-Lena Hamann I think this we will probably see more and more of this type of labelling. The basis is really the gluten, which in the perception of most consumers is the harmful ingredient.

Gluten free brown bread What I want to mention here, going back to slide 9, is that when we tested these products in France, Italy and Spain, the brown bread scored equally high and was one of the preferred products. So this is why I then decided to go into more detail on this product. We don't have time to go into detail on all the products so we will focus on the brown bread.

Gluten free brown bread assessment Overall consumers were pleasantly surprised by the taste of the bread but would like it to be less powdery. Other factors were:

Taste

- ✓ Mild sweet taste
- ✓ Seeds add texture to the tasting experience
- × Some feel the bread or crust tastes burnt
- ✓ A few across groups: tastes and smells like normal bread

Texture

- × It disintegrates too fast in the mouth/becomes powdery
- × Feel it is a bit dry (older consumers)
- × Not enough difference in texture between the inner bread and crust (older males)
- × The bread is too delicate/falls apart (older males)

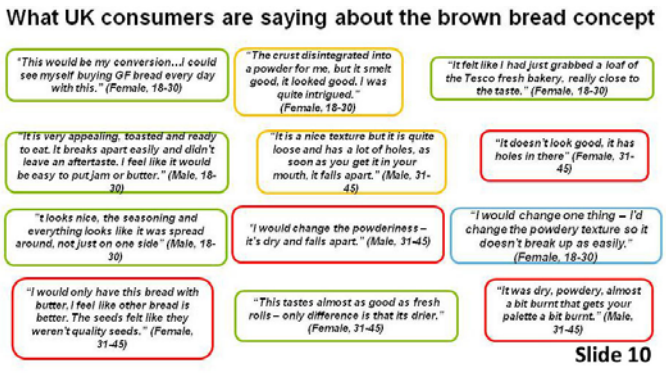
Appearance

- ✓ Nice color and crust
- ✓ Looks premium (millennial males)
- ✓ Seeds add visual appeal
- × Too open in texture (too 'holey')

Size

- ✓ Size is similar to normal packaged sliced loaves

I think great feedback is that some people thought that it tasted and smelled like normal bread, because this is always the challenge, that basically consumers want the gluten-free products to have a very similar taste and eating quality to the equivalent gluten containing products. So the fact that some consumers felt that the gluten free brown bread tastes and smells like normal bread is great feedback. However some consumers said that they felt the crust tasted a bit burnt!



So to summarise the improvement areas required: fewer large holes in the breadcrumb; the crumb should disintegrate less quickly in the mouth; and the crumb should be more moist. We also captured some consumer quotes, see slide 10.

We then gave the consumers the packaging from the slide 8 tests so that they could see: who the producer is; what's the brand; what's the label; what are the ingredients; and what are the claims. From the claims the gluten-free claim is seen as the most important, slide 11. Being gluten-free is why consumers purchase

gluten-free products and after that they basically want to see other claims that provide some kind of health benefit.

Slide 11 The "gluten free" claim is the most important to consumers. Additional claims which can provide a health benefit are also appealing

Most appealing claims	Other appealing claims
Gluten free	Milk free
High fibre	OMEGA 3
No added preservatives	Vegan/vegetarian friendly
Low saturated fat	Sugar free
Low carbs/calories	Wheat free
Low sugar content	

Comment from a delegate No claim for salt or sodium in slide 11?

Anna-Lena Hamann True but the items on the lists were all prompted from claims on the product packaging. So the fact that low sodium/low salt are not included doesn't mean that they not considered important.

What is really important for gluten-free consumers is that the taste has to be right and the product needs to be right for the eating occasion, slide 12. This slide lists desirable attributes for savoury gluten free products and sweet gluten free products, together with: the target consumers; the eating occasions; and reassuring information for each group. For example: the wrap needs to be firm to hold the filling; the bread texture needs to be suitable for spreading with butter; the sweet products should have a fluffy texture; the eating occasion for bread is breakfast or for sandwiches; a reassuring claim for savoury products could be 'rich in fibre'. See the full lists in slide 12.

To successfully resonate with consumers, the overall proposition should respond to consumer tastes and be relevant for specific consumption occasions

Slide 12

What I find interesting about the eating occasion is that most of the current gluten-free products are positioned as a breakfast item, or as a snack. Is this because that's just the majority of the gluten free products that we have nowadays, or because people mention these eating occasions most often? Which one is influencing the other? That's the question that I can't really answer. There was mentioned in terms of sweet products an additional claim for low sugar, salt, and fat, so here salt was mentioned.

So a summary of my paper below:

a) Gluten-free is **no longer a niche**, but has reached the mass market.

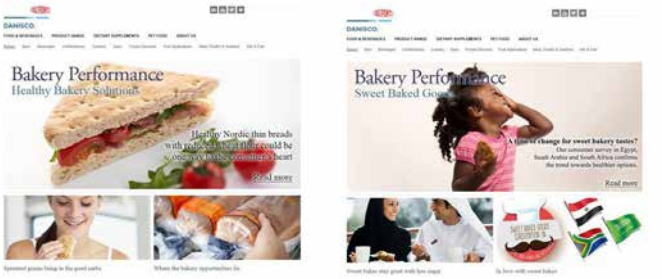
   - Growth may be slowing down in some markets as the sector reaches a degree of maturity, but with double-digit growth rates in most countries this is still one of the most dynamic segments in the food industry.

b) Gluten-free products are perceived as healthier options. In addition to gluten-free, consumers are looking for improved nutritional profile and simplified ingredient declarations.

c) The analysis of drivers for liking GF products has shown that there are many concrete opportunities by country and product type to innovate and improve the current gluten free offering.

If you are interested in more information recommend you visit the bakeryperformance.com website, see slide 13. These are screenshots of previous campaigns that we have carried out. This is typically where we share information and where we will share more information on gluten-free from our research.

Slide 13 If you would like to receive more information on this upcoming campaign, visit *BakeryPerformance.com*



…or contact me: *Anna-Lena.Hamann@dupont.com*

If you have any other questions with regard to the gluten-free topic or our research, I'm very happy to answer questions by email. My email address is: Anna-Lena.Hamann@dupont.com Thank you very much for your attention.

Richard Hazeldine, Session Chair Thank you Lena. We've got a few minutes if there are any questions?

Question from delegate With so much of the demand coming from the non-medically diagnosed consumer, is there not a demand for a **reduced** gluten range of products?

Anna-Lena Hamann Yes, and I think it's interesting. When we spoke about wheat-free and I kind of called this is the 2.0, this for me is the 3.0, because I think nowadays the good news is with the whole health trend, consumers are interested in food, and I think that is a great thing. Of course, there are a lot of misconceptions in the world but the good news is people are interested. So with every year that goes by, people also learn more and more. So initially where maybe the gluten was thought of as a harmful ingredient, people realise more and more, what is meant by gluten? Gluten is in so many different grains and what are the different grain types? And then you have FODMAP for instance. The digestive health is becoming more and more interesting I think for consumers. So, yes, the reduced gluten I think is also definitely one of the areas that could be very interesting. Already on the market I see that there are producers putting out reduced gluten flour. So there is innovation in the space, and especially if you think about FODMAP, it is basically eating more spelt for instance, a different kind of gluten than the wheat gluten.

There is still a lot of educational work to be done definitely, maybe from the industry, but then also from the consumer side to get more educated, to learn more about nutrition.

Question from delegate You mentioned that consumers become aware of gluten-free from the media, from being out shopping and from eating out. Is there any research that looks at where consumers purchase and eat gluten-free because as small craft bakers we've never had any success in selling gluten free products? Is this because people assume that a craft baker will not be able to produce gluten-free bakery products so their shopping habits tend to take them to a specialist shop or a supermarket?

Anna-Lena Hamann That's very interesting, so you had a gluten-free offering?

Delegate Yes we had but our customers just continued buying our usual standard bakery products. It was almost like, as a craft baker, we weren't perceived as being able to produce a gluten-free product. Customers would pick it up off the shelf in the supermarket or order online and have it posted to them. The perception appears to be that you can only get gluten-free if you go to large retailers or to a specialist supplier.

Anna-Lena Hamann That's very interesting and it definitely used to be the case. However speaking to artisanal bakers, I see that some are looking at the possibility of producing gluten free products.

The difficulty of course is how do you produce the gluten free products in a craft bakery without any contamination with gluten from normal flour, from work surfaces, from mixing bowls and from processing equipment? If you are selling a product as gluten free there cannot be **any** contamination with gluten, even though probably, many of the consumers are not coeliac sufferers. So the challenge of making uncontaminated gluten-free products is still there but even if you succeed, it could be that consumers don't trust gluten free supply from a craft bakery yet. I haven't done the research, so the above is just an assumption on my part.

Comment from a delegate I believe that Tesco and Sainsbury's are now selling gluten-free products in their instore bakeries! They presumably have overcome the contamination problem by segregating the production of gluten free products from standard products. Customers must be buying the gluten-free products otherwise these supermarkets wouldn't still be making them.

Richard Hazeldine, Session Chair Thank you Lena that was very interesting and very insightful and you handled the questions very well indeed. *Applause*

Paul Turner, BSB Chairman I would like to add my thanks to Lena for an excellent paper and for standing in at short notice. Thanks also to the other speakers – you have all been fantastic and we have learned a lot from you. Thanks also to Richard and Sara as Session Chairs and to everyone who has been involved in the planning and running of another very successful BSB conference. Some dates for your diary are as follows:

2018 Spring Conference, Wednesday 25th April at the National Bakery School, London South Bank University

2018 BSB Golf Day Tuesday 5th June, Arden Course, Forest of Arden Hotel and Country Club

2018 Autumn Conference, Wednesday 17th & Thursday 18th, Heythrop Park Hotel, Enstone, Oxfordshire

Further information on all these events, as well as on our planned Student Day initiatives, will be coming out by mail-shots from early in 2018, and will be on our website: https://britishsocietyofbaking.org.uk

Many thanks for your attendance and have a safe journey home.

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Paul Turner gives a welcome to the dinner

Comedian George Zach keeps everyone amused

BSB Vice Chair Jane Tyler and Chair Paul Turner

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Ward	K J	Ambit International Ltd
Ward	C J	Ambit International Ltd
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