

Welsh Lamb Meat Quality Project

First Year Report



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The programme encompassed three strategic projects: Stoc+, an animal health planning project, Hill Ram Scheme, a genetic improvement project and Welsh Lamb Meat Quality project, an eating quality project.



Foreword

Protected Geographical Indication (PGI) Welsh Lamb is a premium food product, with a worldwide reputation for quality and taste.

To ensure the sector is as resilient, sustainable and profitable as possible in an increasingly competitive global marketplace, HCC has established the Welsh Lamb Meat Quality project as part of its Red Meat Development Programme.

A comprehensive five-year study into the sector, the Welsh Lamb Meat Quality project draws on best practice to build a blueprint of taste consistency - enabling Welsh farmers and processors to meet the demands of a changing market.

This booklet provides the meat quality results from the Welsh Lamb Meat Quality project's first trial conducted in early 2020.

The project was designed to investigate the effect of on-farm and processing factors on the eating and nutritional quality of lamb. The trial drew together 480 consumers, at three locations across the UK, who assessed the meat eating quality of Welsh Lamb.

Included here is an analysis of the consumer taste panel meat eating quality results, as well as demographic influences and participants' lamb purchasing habits.

Also explored is the importance of the nutritional quality of lamb products.



Summary

The Welsh Lamb Meat Quality project aims to investigate the impact of on-farm and processing factors on the meat eating quality of Welsh Lamb.

This first trial explored the effects of breed type, meat cut, and lamb gender on eating quality.

Consumer taste panels took place during January and February 2020 in Belfast, Cardiff, and Newport (Shropshire), with panel members drawn from the surrounding area. During the tasting sessions, the panellists were unaware it was Welsh Lamb.

The consumers tasted and rated seven pieces of lamb, basing their eating quality scores on the attributes of aroma, tenderness, juiciness, liking of flavour, and an overall liking on a 0-100 line scale.

The lambs were sourced for the project from farms across Wales to achieve a range of characteristics, with breed types including hill, crossbred and terminal sired lambs.

The meat cuts analysed were loin, topside and chump, and the majority of all three cuts scored well by all for palatability. In particular, the loin and chump scored particularly favourably with the consumers for all eating quality traits, with the topside scores also within an acceptable mean score.

It was found that while consumers could detect a variation in eating quality between muscle cuts, there was no significant difference between breed or lamb gender.

Consumers rated the satisfaction level of each sample on a four-point category scale:

- > Unsatisfactory
- > Satisfactory everyday quality
- > Better than everyday quality
- > Premium quality

For all three cuts, 80% of the consumers rated the lamb at 'Satisfactory everyday quality' and above. While nearly half of the consumers (46.5%) rated both the loin and chump muscle at 'Better than everyday' and 'Premium quality'.

The consumers also completed a demographic questionnaire, which showed the age and gender of the panellists was an influencing factor on lamb purchasing behaviour.

Encouragingly, the results showed that consumers were willing to pay more for higher quality lamb meat, and significantly, the younger age consumers were willing to pay more for quality.



Background

Lambs were sourced for this trial from farms across Wales where different farming systems suited to their location and environment are employed.

Welsh Lamb eating quality is considered to be generally very good. Still, with an increasingly competitive marketplace and a more discerning consumer, there is a need for continued research to provide evidence of its quality.

Several influences can create variation in eating quality. Among them are on-farm elements such as finishing diet, lamb gender, management systems, and breed types. Also, there are processing factors such as ageing, different meat cuts and hanging methods.

Consumer panels are an essential tool to assess meat quality and provide insight into public opinion and eating experience. The Agri Food and Biosciences Institute (AFBI) arranged the methodology for the consumer taste panels.

Method

Sourcing of lambs

The Welsh abattoirs taking part in the first trial sourced a total of 96 lambs from farms across Wales (Figure 1). The lambs were sampled on eight dates between November 2019 and January 2020.

The lambs were selected to be slaughtered at a target specification:

- > Carcase cold weight 16-22kg
- > Conformation grade of E,U,R
- > Fat class 2-3L

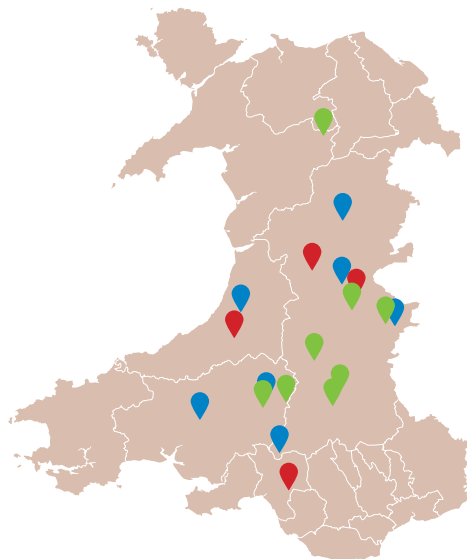
Three breed types were sampled:

- > Hill
- > Cross-bred
- > Terminal

Each breed type was balanced by gender and the trial used 48 castrated and 48 ram lambs.

Three muscle cuts – loin, chump and topside – from both sides of each lamb were sampled and labelled for assessment (Figure 2).

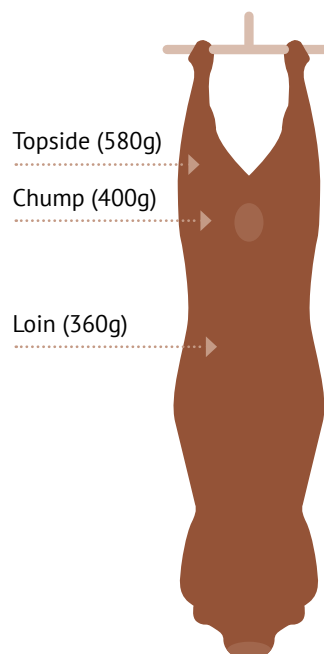
Figure 1



Key

- ◆ Hill – Welsh Mountain, Improved Welsh & Beulah
- ◆ Cross – Welsh Mule
- ◆ Terminal – Texel, Suffolk & Rouge

Figure 2





Sample Preparation

The muscle cuts were sent to the Food Branch at the Agri-Food and Biosystems Institute (AFBI) where they were aged for nine days at 4°C.

A loin, chump or topside cut from each side was prepared for sensory analysis, using the same globally recognised standard techniques developed by Meat Standards Australia (MSA).

The samples were cut into 15mm thick similar-sized square pieces before being wrapped for grilling.

They were 'balanced' so that each cut would be sampled by different people, in other locations and on different dates.



Consumer Taste Panels

The consumer taste panels for Trial 1 took place in January and February 2020 at three locations – Belfast, Cardiff and Newport in Shropshire. The panels were run according to the MSA protocols; each venue hosted 160 consumers in eight groups of 20.

To minimise any potential bias, the consumers were aware that they were tasting lamb but didn't know its origin. All consumer data collected was anonymous, and to prevent influencing their neighbours, they sat in individual booths.

The session began with a demographic questionnaire where the consumer was asked about their background, lifestyle and previous experience when buying lamb. This information was also analysed so that consumer purchasing behaviour could be understood.

The second part of the questionnaire was an eating quality assessment of seven grilled samples of different cuts of meat. Consumers were asked to score them on a 0-100 line-scale based on:

- > Liking of aroma
- > Tenderness
- > Juiciness
- > Liking of flavour
- > Overall liking

Consumers were also asked to rate the satisfaction quality of each sample based on a four-point scale:

1. Unsatisfactory
2. Satisfactory everyday quality
3. Better than everyday quality
4. Premium quality

Thirdly, consumers were asked about their 'willingness to pay' for each of the satisfaction grades.

Nutritional quality method

The remaining meat cuts were used for nutritional quality analysis. The loin, chump and topsides were studied for their total amount of intramuscular fat content and individual fatty acids.

Analysis

The consumers' eating quality data and the accompanying demographic information was analysed, and each taste panel questionnaire tabulated using specialist software. Additional quality assurance checks followed.

Statistics regarding the effects of muscle cut, breed type, gender, and panel location were analysed, as was information such as fat class and conformation grade information obtained from the abattoirs.



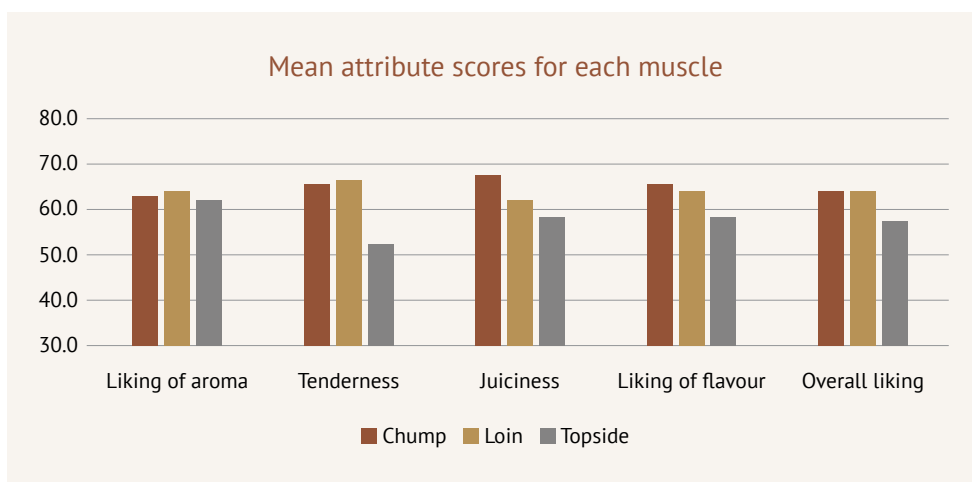
Results

Meat eating quality

Consumers could detect a variation in eating quality between muscle cuts but not breed or gender (Figure 3).

The majority of cuts scored well by all consumers for palatability, with the loin and chump scoring favourably for all eating quality traits. The topside scores were within an acceptable mean score.

Figure 3



In this trial, consumers could not taste any difference between ram lambs and castrate lambs (Table 1). Also, in this trial, lamb gender did not affect eating quality significantly.

Table 1

Attribute	Average eating quality scores (0-100)		Probability	Significance
	Castrate	Ram		
Liking of Aroma	63.3	63.1	0.19	ns
Tenderness	61.2	60.8	0.30	ns
Juiciness	62.7	62.5	0.25	ns
Liking of flavour	62.8	63.2	0.74	ns
Overall liking	62.0	62.2	0.29	ns

ns – not statistically/significantly different

Consumers found that breed type did not make any significant difference to meat eating quality traits, as can be seen in Table 2.

Table 2

Attribute	Average eating quality scores (0-100)			Probability	Significance
	Hill	Crossbred	Terminal		
Liking of Aroma	63.3	62.5	63.9	0.19	ns
Tenderness	61.2	60.1	61.8	0.30	ns
Juiciness	62.4	61.9	63.6	0.25	ns
Liking of flavour	63.1	62.6	63.2	0.74	ns
Overall liking	62.2	61.2	62.9	0.29	ns

ns – not statistically/significantly different



Demographic Results

Consumers were asked about:

- Previous buying habits (including frequency of buying lamb products).
- Previous experience with lamb.
- What properties they considered to be important when buying lamb.

Consumer Age Group Results

Consumer age had a large impact on behavioural preferences when purchasing lamb. *Willingness to pay* was also significantly influenced by consumer age.

Age group effect on Lamb Product Purchases

63% of the Over 65 age group said they eat Lamb Chops on a weekly or monthly basis, as did 53% of the youngest age group (18-24). This is shown in Figure 4.

Figure 5 demonstrates the impact of consumer age when purchasing Lamb Legs. More than half (57%) of the 55-64 age group eat *Lamb Legs* on a weekly or monthly basis. Also, 47% of the 18-24 age group said they eat them on a weekly or monthly basis.



Figure 4

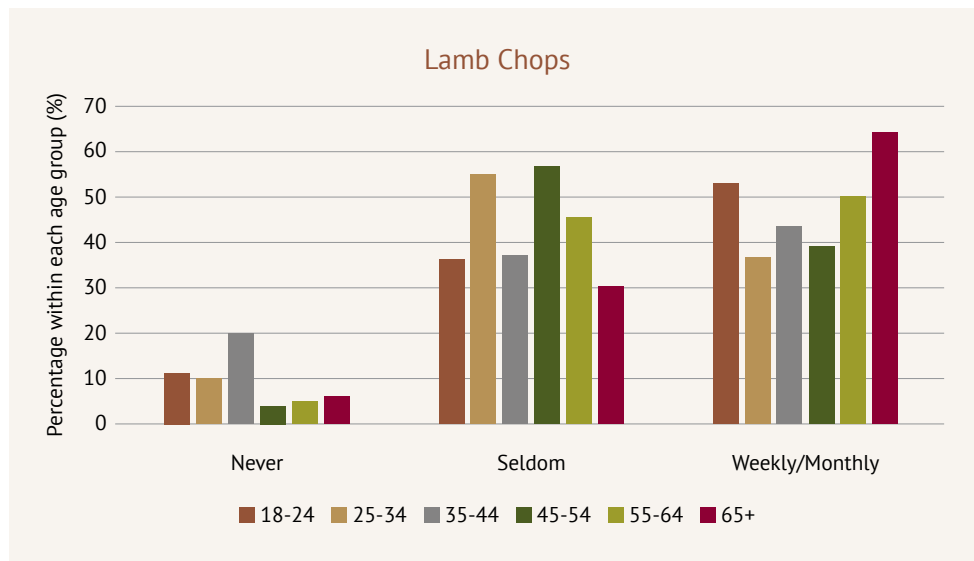
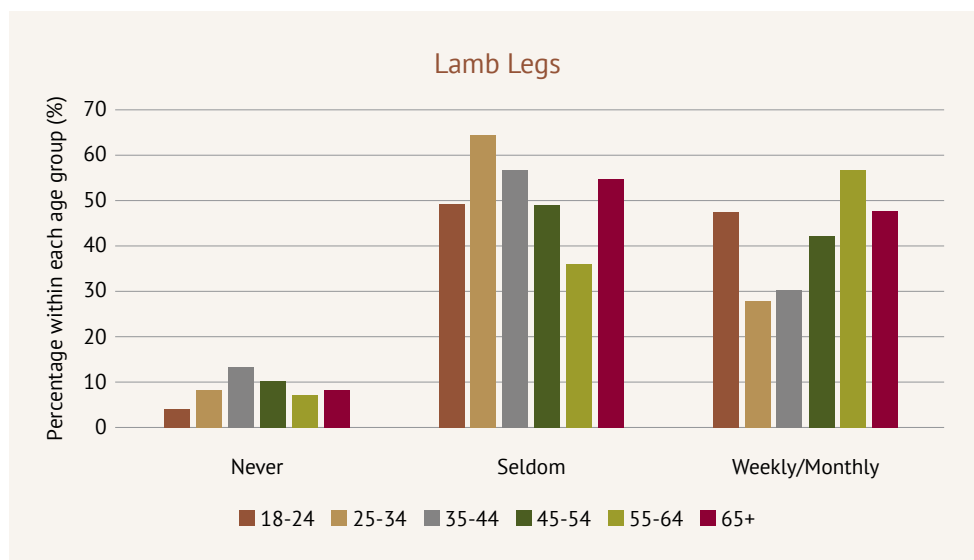


Figure 5



The versatility of *Diced and Minced lamb* products for use in home cooking appears to especially appeal to younger consumers, with 40% of the 18-24 age group buying these products on a weekly or monthly basis.

Ready-made lamb products were not regularly purchased by any of the age groups, with half of the over 34 age groups having never purchased *Ready-made lamb* products.

However, nearly a quarter of the youngest age group (18-24) have a *Ready-made lamb* meal on a weekly or monthly basis – potentially identifying a gap in the market for food service and retailers.

Age group effect on experience when buying lamb

Age had an impact on consumer experience when it came to *Ease of Preparation* with consumers, with older consumers finding preparation easier.

Figure 6 shows that consumers over 45 find it easier to prepare lamb. In the over 55 age groups, 48% thought that lamb was easy to prepare, while only 12% of the 18-24 age group thought lamb was easy to prepare.

When asked about previous experience with lamb flavour (Figure 7) over two thirds of all consumer age groups stated that lamb has a 'moderately high' or 'highly consistent' flavour. In the 55-64 age group 29% of consumers scored lamb as having a 'highly consistent flavour' with their previous purchases.

Figure 6

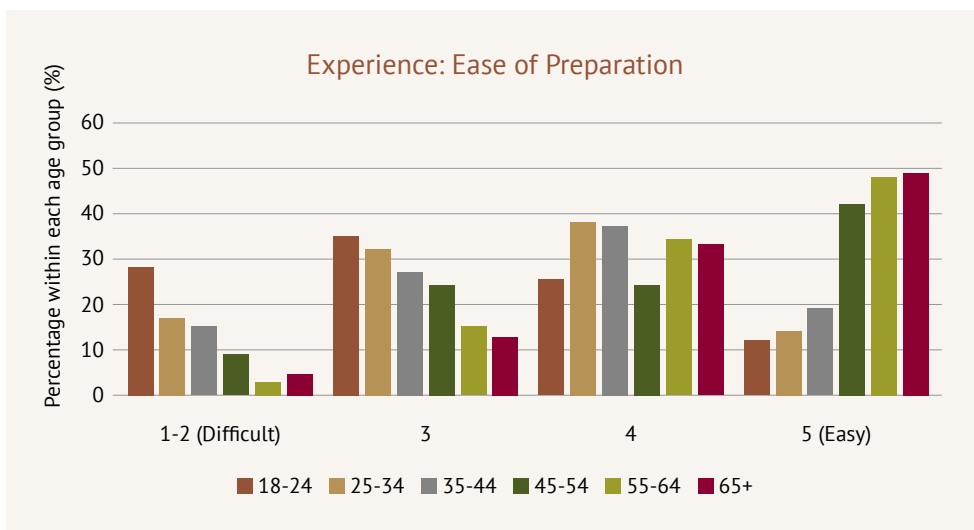
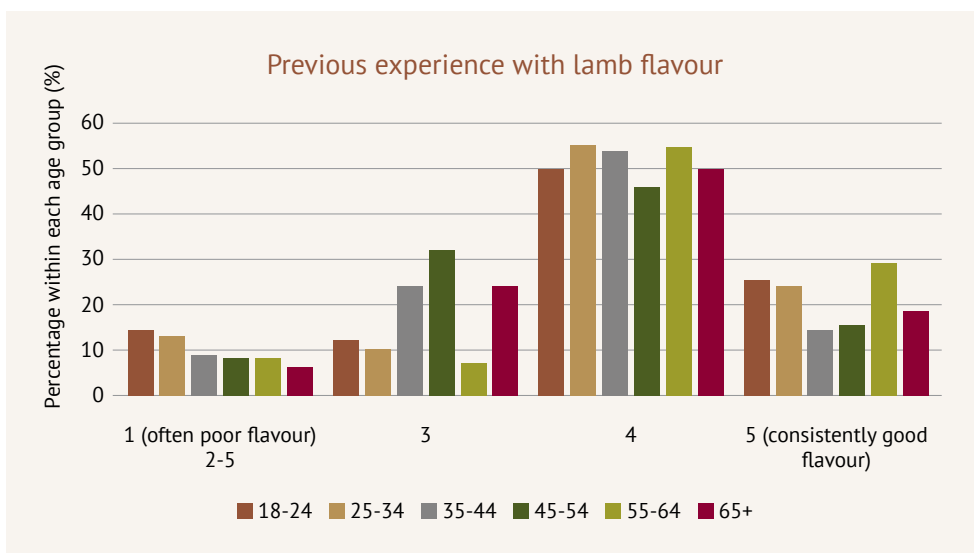


Figure 7



Sensory properties that were considered important for consumers especially for age groups Over 45, included *Tenderness*, *Juiciness* and *Cooked Aroma*.

More than 75% of those in the over 45 age groups thought that Tenderness was 'very important' when purchasing lamb (Figure 8).

Over 86% of all consumers considered *Juiciness* as either 'moderately' or 'very important' when purchasing lamb. The majority of older age groups (95%+) scored *Juiciness* as 'moderately' or 'very important' (Figure 9).

Tenderness and *Juiciness* were sensory traits that were more important for the consumers than cooked aroma.

Nearly 70% of all consumers in the Trial 1 considered *Appearance* as 'moderately important' or 'very important' when purchasing lamb (Figure 10).

Those in the 45-54 age group were particularly influenced by *Appearance*, with nearly half thinking that *Appearance* was 'very important' when purchasing lamb.

Figure 8



Figure 9

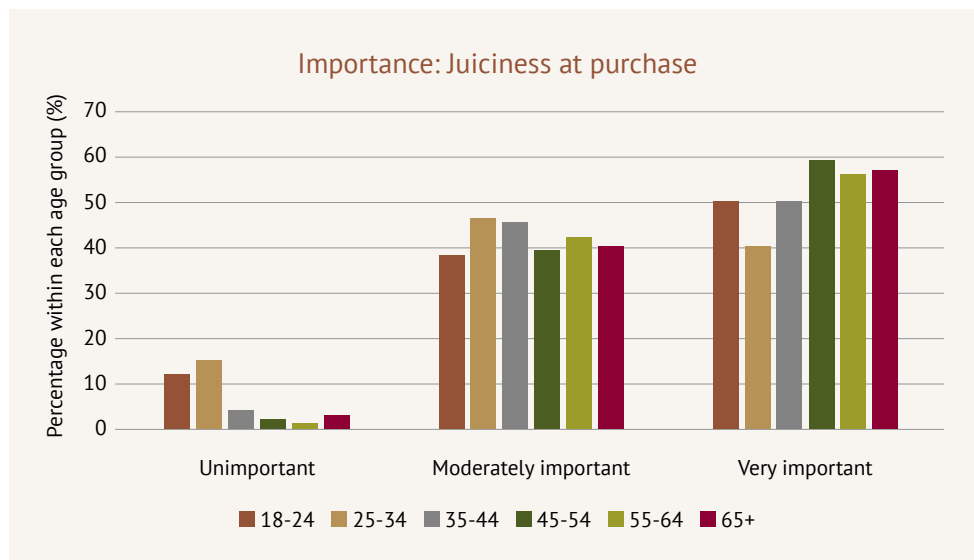
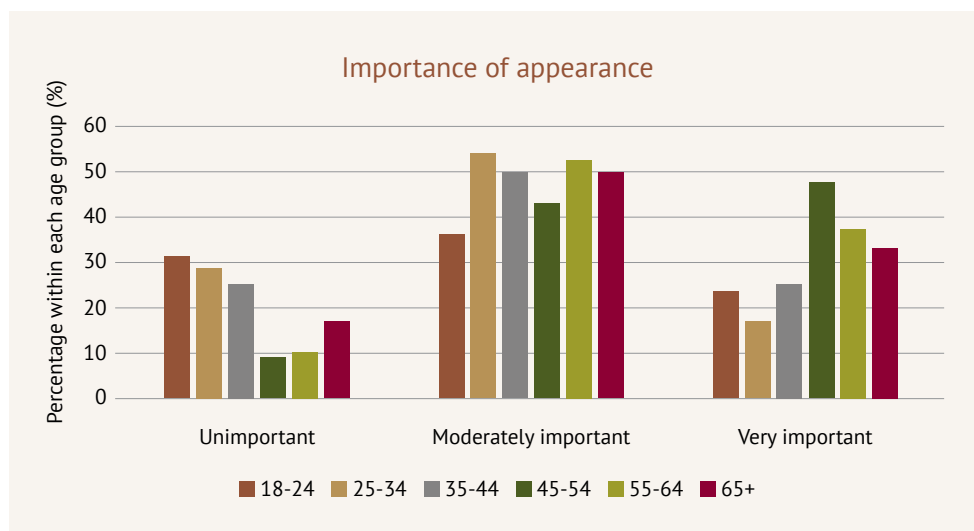


Figure 10



Trial 1 also looked at other quality parameters when buying lamb.

It was found that the older generations also placed importance on *Nutritional value* (Figure 11), *Environmental impact*, *Animal Welfare*, and *Knowledge of Source* (Figure 12).

Knowledge of Source was a ‘very important’ factor when purchasing lamb to 56% of the over 65 group and to 51% of the 55 – 64 age group.

Also, nearly half of the 18-24 age group said that *Knowledge of Source* was ‘very important’ to them when buying lamb.

This data is particularly relevant to PGI Welsh Lamb and highlights the importance of adding *Source* to packaging.

Figure 11

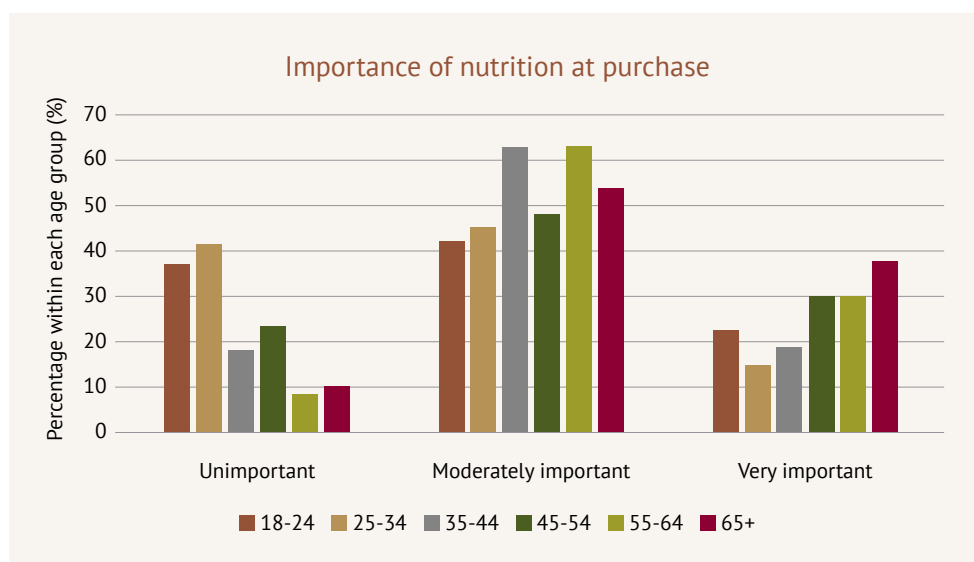
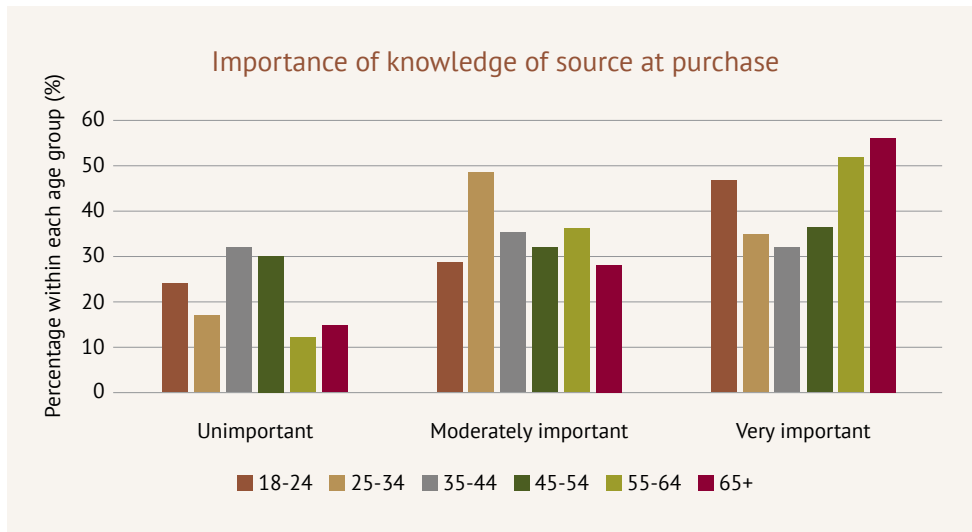


Figure 12

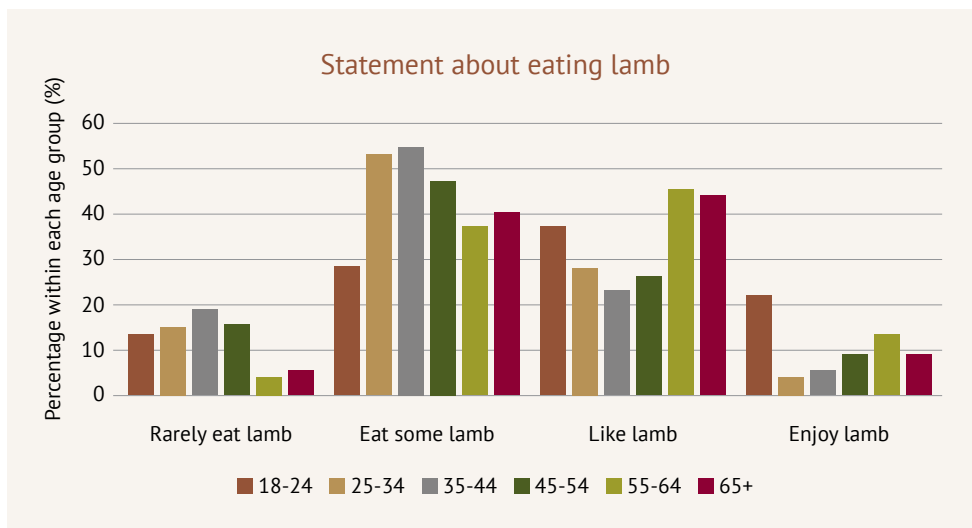


The consumers were asked about their enjoyment of lamb, by marking which of the following statements applied to them:

- > I enjoy lamb. It's an important part of my diet.
- > I like lamb well enough. It is a regular part of my diet.
- > I do eat some lamb although it wouldn't worry me if I didn't.
- > I rarely eat lamb.

Two-thirds of those under 25 marked the statements “I enjoy lamb. It's an important part of my diet” or “I like lamb well enough. It is a regular part of my diet” (Figure 13).

Figure 13



Willingness to pay

After the consumers had been asked the demographic questions and had tasted and rated the lamb, they were asked how much money they would be willing to pay for different grades of quality, and the results are shown in Figure 14.

The average *Willingness to pay* over all the age ranges for all different standards of quality was £7.78 per kilogram. It should be noted that many people from Trial 1 were not willing to pay anything (£0) for unsatisfactory meat quality.

Consumer groups differed significantly for how much they were willing to pay for ‘*Satisfactory everyday quality*’ and ‘*Better than everyday quality*’.

Generally, the age groups 18-24 and 35-44 did not want to pay a premium for a ‘*Satisfactory*’ or ‘*Better than everyday*’ products. Those over 55 were willing to pay higher prices for meat graded higher quality (Figure 14 and Table 3).

Figure 14

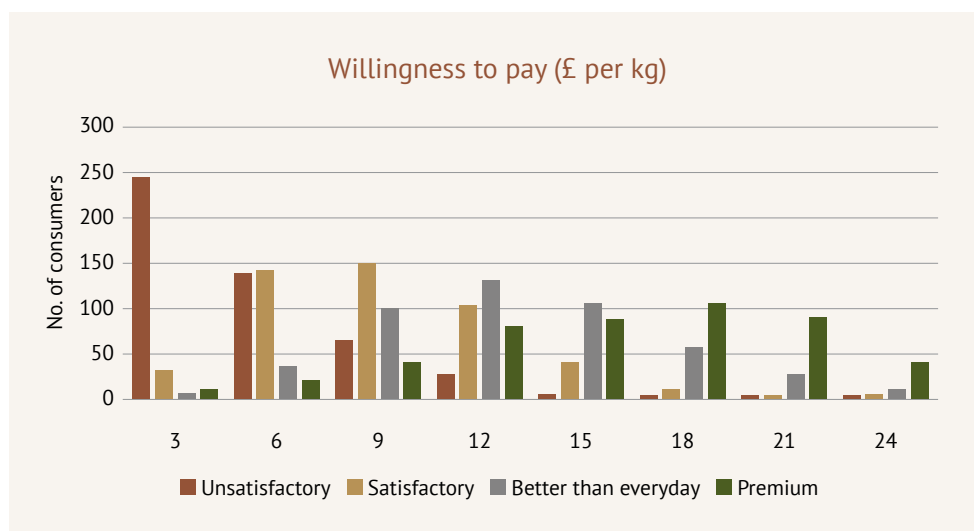


Table 3 demonstrates that the price consumers are prepared to pay for a ‘*Satisfactory everyday quality*’ generally increases with increasing age range. The exception is the 25-34 group, who were willing to pay more than both the 35-44 and 45-54 age ranges.

Table 3

Quality Grade	Willingness to pay for quality (£/kg)					
	Age groups					
	18-24	25-34	35-44	45-54	55-64	65+
Unsatisfactory	3.41	3.85	3.02	3.64	4.22	4.58
Satisfactory everyday quality	6.81	7.61	7.17	7.60	8.00	9.48
Better than everyday quality	10.97	11.56	10.89	11.00	11.60	12.93
Premium quality	14.70	15.54	14.29	14.56	15.05	15.96

Using the average for *'Satisfactory everyday quality'* (£7.78/kg) as the reference, Table 4 shows the percentage each age group is willing to pay for each quality grade of lamb. It has been adjusted so that the *'Satisfactory everyday'* quality value is at a baseline of 100.

It was found that generally consumers wanted to pay half the amount for *'Unsatisfactory' lamb* and an additional half of the amount for *'Better than everyday' lamb*. Some consumer age groups were willing to spend more than double for *'Premium quality'* graded lamb.

Willingness to pay for different quality grading for each age group is demonstrated in Table 4.

Table 4

Satisfactory = 100	% for each age range relative to satisfactory					
	18-24	25-34	35-44	45-54	55-64	65+
Unsatisfactory	50.1	50.6	42.1	47.9	52.8	48.3
Satisfactory everyday quality	100.0	100.0	100.0	100.0	100.0	100.0
Better than everyday quality	161.1	151.9	151.9	144.7	145.0	136.4
Premium quality	215.9	204.2	199.3	191.6	188.1	168.4

Consumer Gender Results

Gender effect on experience when buying lamb

Previous experience of buying lamb meant that female consumers perceived that lamb was more *'Expensive'* to buy than their male counterparts (Figure 15). They also found lamb significantly *'Easy to prepare'* (Figure 16).

Also, 17% of females thought lamb was expensive compared to 12% of males. Slightly more men (7%) thought lamb was cheap in comparison to 3% of women.

More female consumers (42%) thought that lamb was *'Easy to prepare'* than men (22%). Only 11% of men and 12% of women felt that lamb was difficult to prepare.

Figure 15

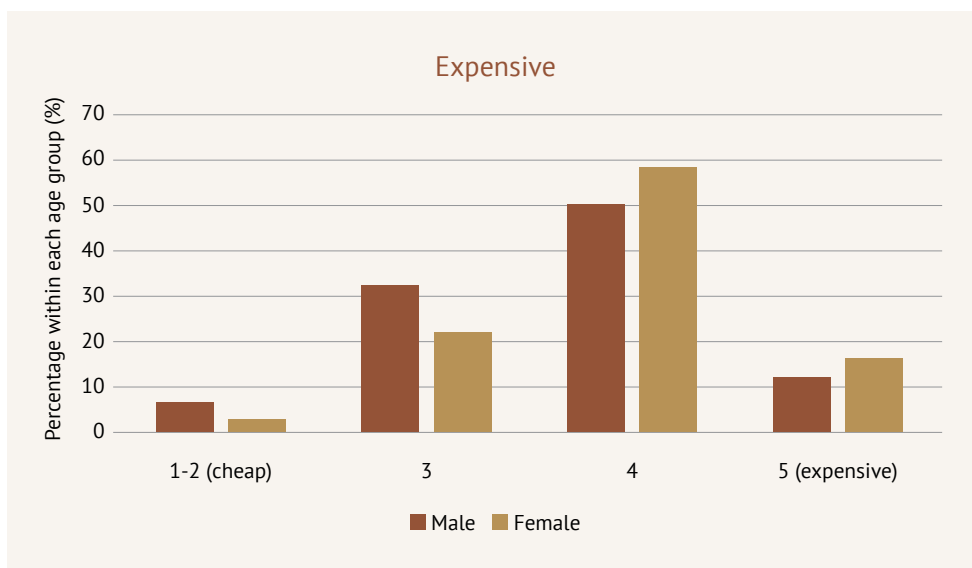
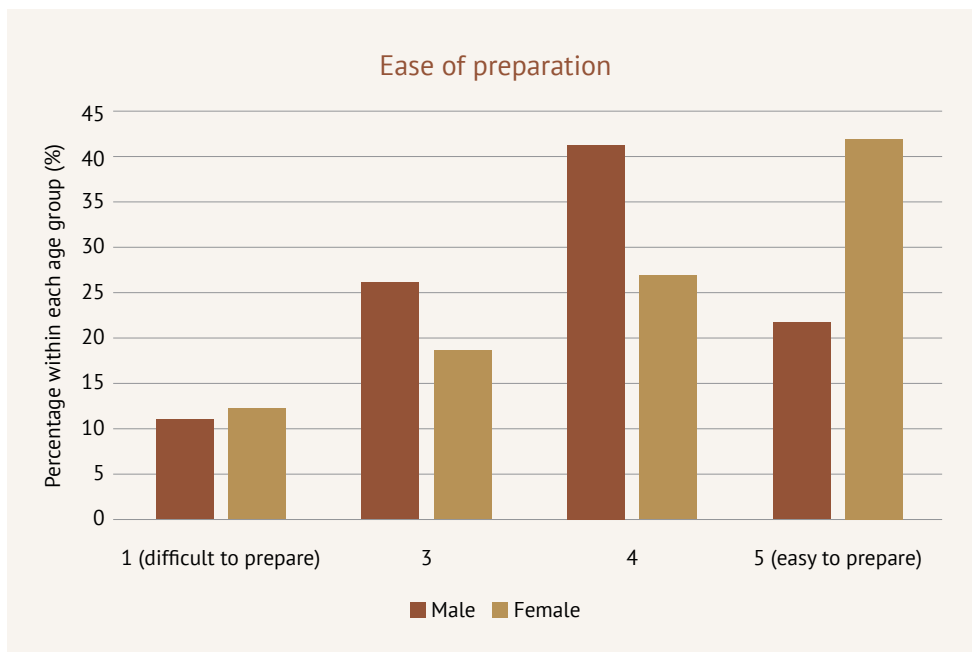


Figure 16

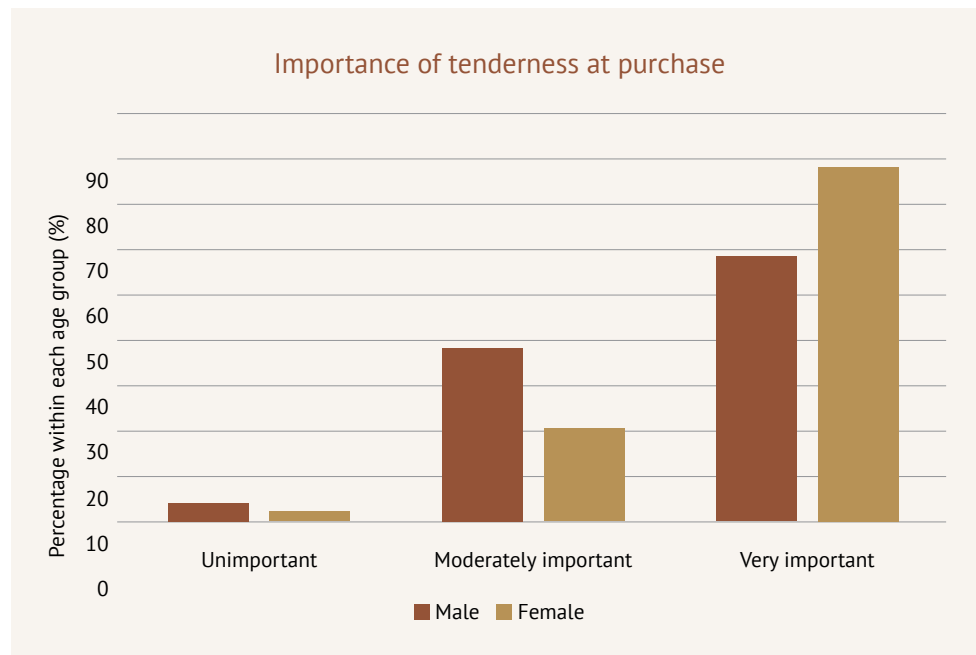


Gender effect on importance of sensory properties when buying lamb

The trial found female consumers placed higher importance on sensory qualities such as *Tenderness*, *Cooked Aroma*, and *Appearance* in comparison to male consumers.

When buying lamb, 79% of females thought *Tenderness* was 'very important' in comparison to 57% of men (Figure 17).

Figure 17



When purchasing lamb, men placed less importance on aspects of *Nutritional Value* or *Healthiness*, *Animal Welfare*, *Impact on the Environment* and a *Knowledge of the Source* of the lamb than their female counterparts.

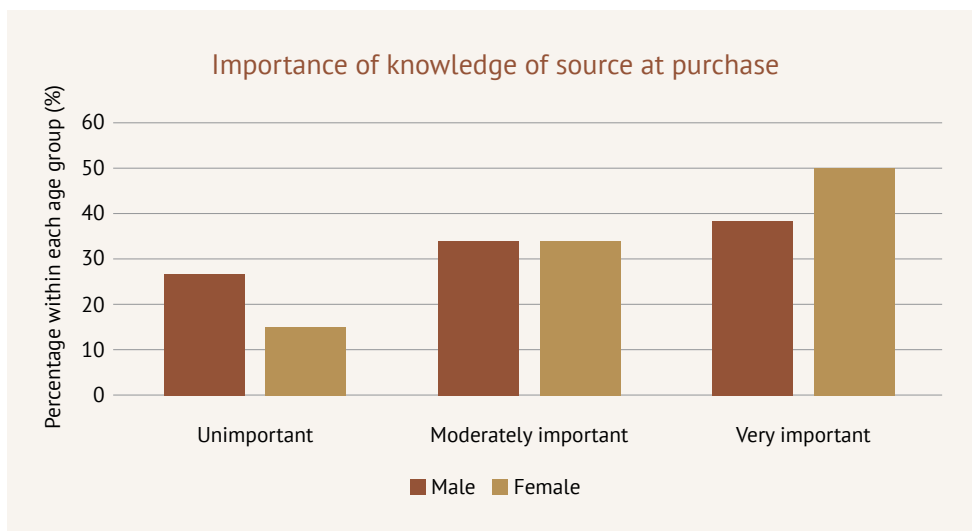
A third of women thought that the *Nutritional Value* of lamb was 'very important' when buying lamb, in comparison to only 18% of men.

Over half of the women involved in Trial 1 thought that *Animal Welfare* was 'very important' at the time of purchase compared to only a third of men.

36% of women and 21% of men thought that *Environmental Impact* was 'very important' when buying lamb.

As shown in Figure 18, 51% of women and 39% of men thought that *Knowledge of Source* was 'very important' at the time of purchase.

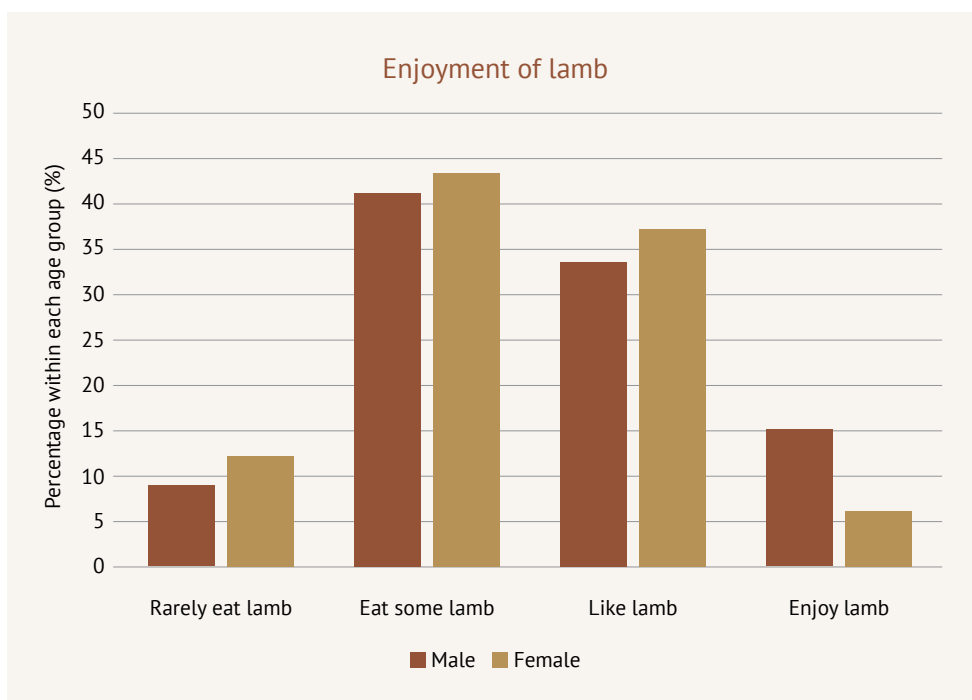
Figure 18



More men than women said that they really enjoyed lamb (Figure 19). In this trial 15% of men and 6% of women answered the following statement “I enjoy lamb. It’s an important part of my diet”.

Also, 34% of men and 38% of women answered “I like lamb well enough. It is a regular part of my diet”.

Figure 19



Nutritional Quality Results

Fats are associated with meat quality and can affect the tenderness, juiciness and flavour of a product.

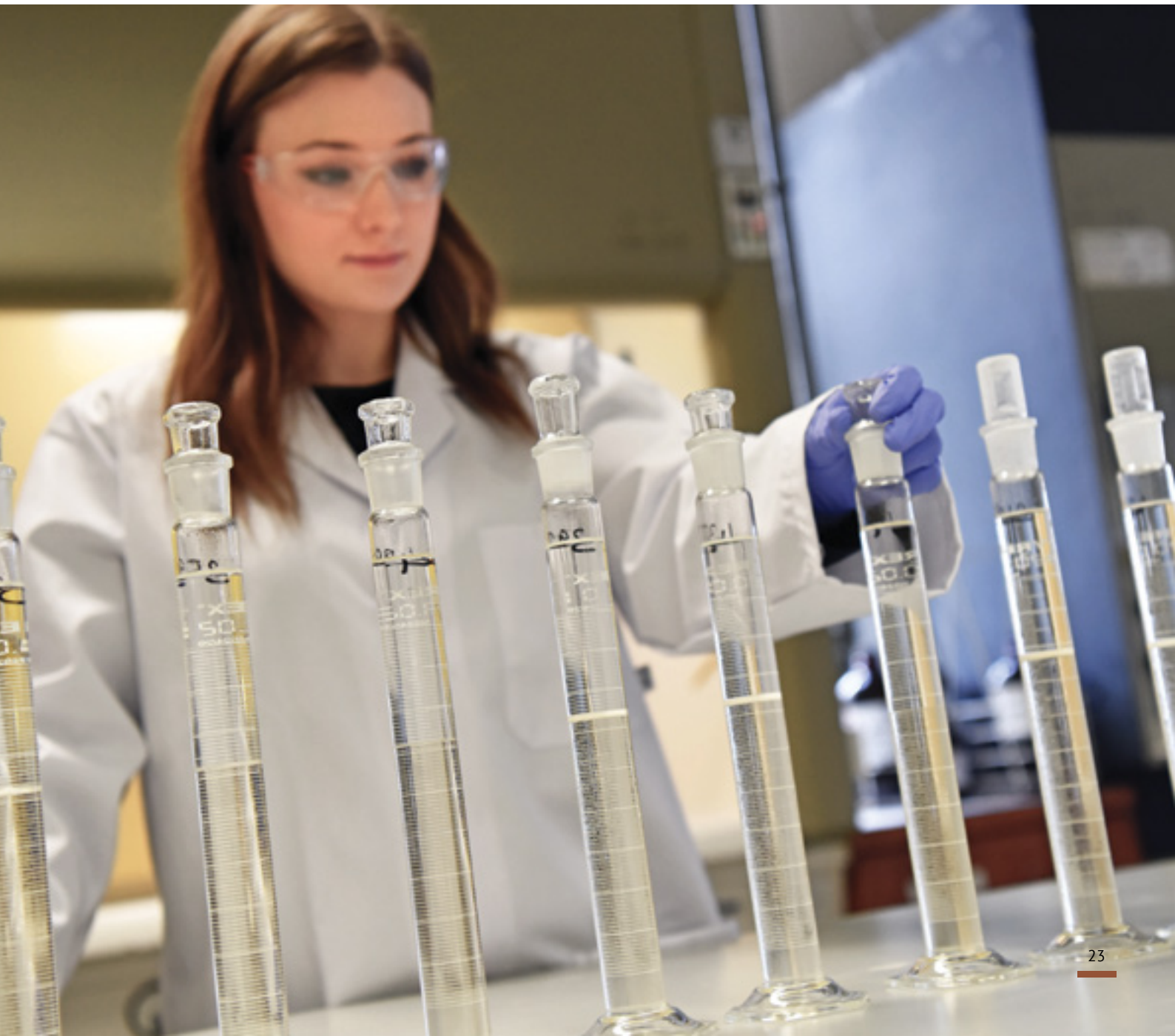
Types of fatty acids

Saturated fatty acids are found in the majority of meat products. A high saturated fat intake can increase cholesterol levels, however some saturated fats are needed for body development, maintenance and protection.

Monounsaturated fatty acids are associated with reducing cholesterol levels.

Polyunsaturated fatty acids are considered healthy fats and are good for the heart. Polyunsaturated fatty acids also include Omega 3 and Omega 6 fatty acids which are essential for the diet.

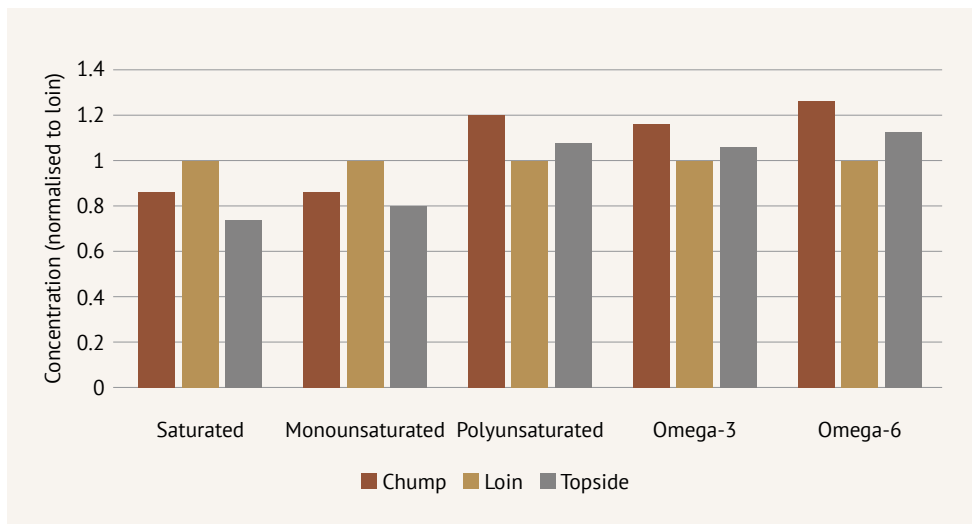
Lamb meat contains all three types of fatty acids.



Results

In Trial 1 three factors were tested; muscle cut, breed type and lamb gender. It was found that muscle cut has the greatest impact on fatty acid amount, rather than breed type or gender. It was observed that the topside cut had the lowest intramuscular fat content at 3%. Topside had lower levels of saturated and monounsaturated fat content, and the chump had the highest amount of polyunsaturated fatty acids (Figure 20). It is suggested that the muscles differed in fat content dependent on their biological role within the body.

Figure 20



Breed type had no effect on the major fatty acid groups and relatively few of the individual fatty acids. However, terminal sired lambs had lower concentrations of intramuscular fat, saturated fats and monounsaturated fats in loin only.

Effects of lamb gender were that terminal animals had generally higher intramuscular fat, saturated fats and monounsaturated fats than ram lambs.

As lambs were selected for conformation and fat class. The Trial was able to find that conformation had no effect, while fat class had a significant impact on the intramuscular fat, saturated and polyunsaturated fats.

It was found that lamb finishing diet affected fatty acid content. However, as the experiment was not controlled for diet, and the numbers on each diet were variable, it is recommended that these initial results warrant further investigation in a trial designed to investigate this factor.



Conclusions

The first trial in the Welsh Lamb Meat Quality project has provided a range of data on consumer preferences and actions when buying and eating lamb.

By taking influencing factors such as gender, age, and occupation into account, the trial has successfully amassed knowledge that will contribute to the findings and recommendations of the overall Project.

Ultimately, this will provide information for those in the Welsh Lamb industry to meet consumer demands and grow market opportunities.

Among the conclusions from Trial 1 are:

- Consumers were willing to pay more for quality lamb - with some age groups such as the 18-25 age group willing to spend more than double for premium quality graded lamb.
- The age group of panellists and consumer gender mainly affected lamb purchasing behaviour.
- Consumers rated the average eating quality of PGI Welsh Lamb samples highly. However, there is still some variation in eating quality between meat from different lambs.
- While all cuts on average scored highly, muscle cut had a significant effect – and both the chump and loin grilled samples received high eating quality scores.
- Consumers scores did not show any significant preference with different breed type or lamb gender on the eating quality of the Welsh Lamb samples.
- Of the factors tested, muscle cut had the biggest impact on fatty acid composition, with breed type and lamb gender having a lower impact on the nutritional fat composition of lamb.





Industry Implications

The information obtained from Trial 1 has recognised factors in consumer preferences which will help take the Welsh Lamb industry forward, and potentially shape future action throughout the supply chain.

- Consumers from Trial 1 did not detect any differences between breed type and lamb gender. The Welsh Lamb Meat Quality project will continue to investigate lamb gender effect throughout most of the trials.
- For this trial and with the cooking method utilised (grilling), it was found that meat cut had a large effect on consumer eating **quality, and confirmed that the more costly lamb meat cuts had higher** eating quality scores. These results are important for the butchery and retailer sectors.
- Further insight has been obtained to consumer demographic trends and purchasing habits. This information will help to inform the lamb supply chain about marketing challenges and opportunities.
- It was found that younger consumer age groups were willing to spend more than double for premium quality graded lamb than they would for satisfactory lamb. This pattern, although to a slightly lesser effect, was seen with all age groups during the trial.
- Muscle cuts had a strong effect on differing amounts of fatty acids. Breed type and gender had a smaller effect in altering fatty acid content. Increased carcass fat grade also increased total fat amount and diet also altered fatty acid composition. The diet influence needs further investigation.

Evidence from Trial 1 of the Welsh Lamb Meat Quality project shows consumers are interested in the quality of lamb, with different factors influencing their purchase choices. The greatest variation in terms of both consumer preference and nutritional composition was due to the cut, rather than other factors such as lamb gender.

The insight gained from the meat quality results indicates there are opportunities for the Welsh red meat sector to target different demographics or age groups in varied ways.

