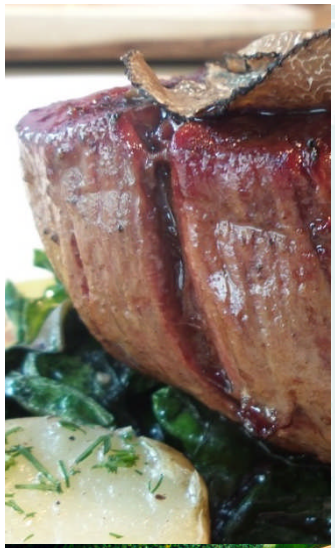
What can sensory methods tell us about meat?

Linda Farmer and Terence Hagan
Food Research Branch, Agri-Food and Biosciences Institute, Belfast, UK

Why worry?

- 20% sirloins, 25% rumps, 53% roast topside – palatability was “unsatisfactory”. Farmer et al 2016
- 75% consumers put off buying steak after a bad experience. AHDB 2016
- Consumers put off buying again for 1 – 3 months. AHDB 2016
- Consumers willing to pay for quality – e.g., fillet

afbi Agri-Food and Biosciences Institute



What can sensory methods tell us about meat?

- What do we want to know?
- What methods are available?
- Examples
- Conclusions

What do we want to know?

- **Will the customers/consumers like it?**
  - *Who are they?*
- **What is the effect of animal production or processing factors?**
  - *Age, sex, breed, hanging, muscle, ageing …*
- **Is a product the same or different to another?**
- **Why do consumers like one product better than another?**
- **Is today's product the same as last week's?**
- **What is the cause of a sensory difference?**
- **Is there a change during the time of eating?**

afbi Agri-Food and Biosciences Institute

Methods

- Will the customers/consumers like it?
  - *Who are they?*
- What is the effect of animal production or processing factors?
  - *Age, sex, breed, hanging, muscle, ageing …*
- Is a product the same or different to another?
- Why do consumers like one product better than another?
- Is today's product the same as last week's?
- What is the cause of a sensory difference?
- Is there a change during the time of eating?

Consumer panels
100s of people
The right people
Untrained
Liking/acceptability

Trained panels
Ca. 10 people
Score attributes
but not liking

Instrumental
Flavour - e.g., GC-MS
Texture - e.g., WBSF
Colour - Spectroscopy

Time intensity
Changes over time

Chemometrics
Statistical methods to link data together

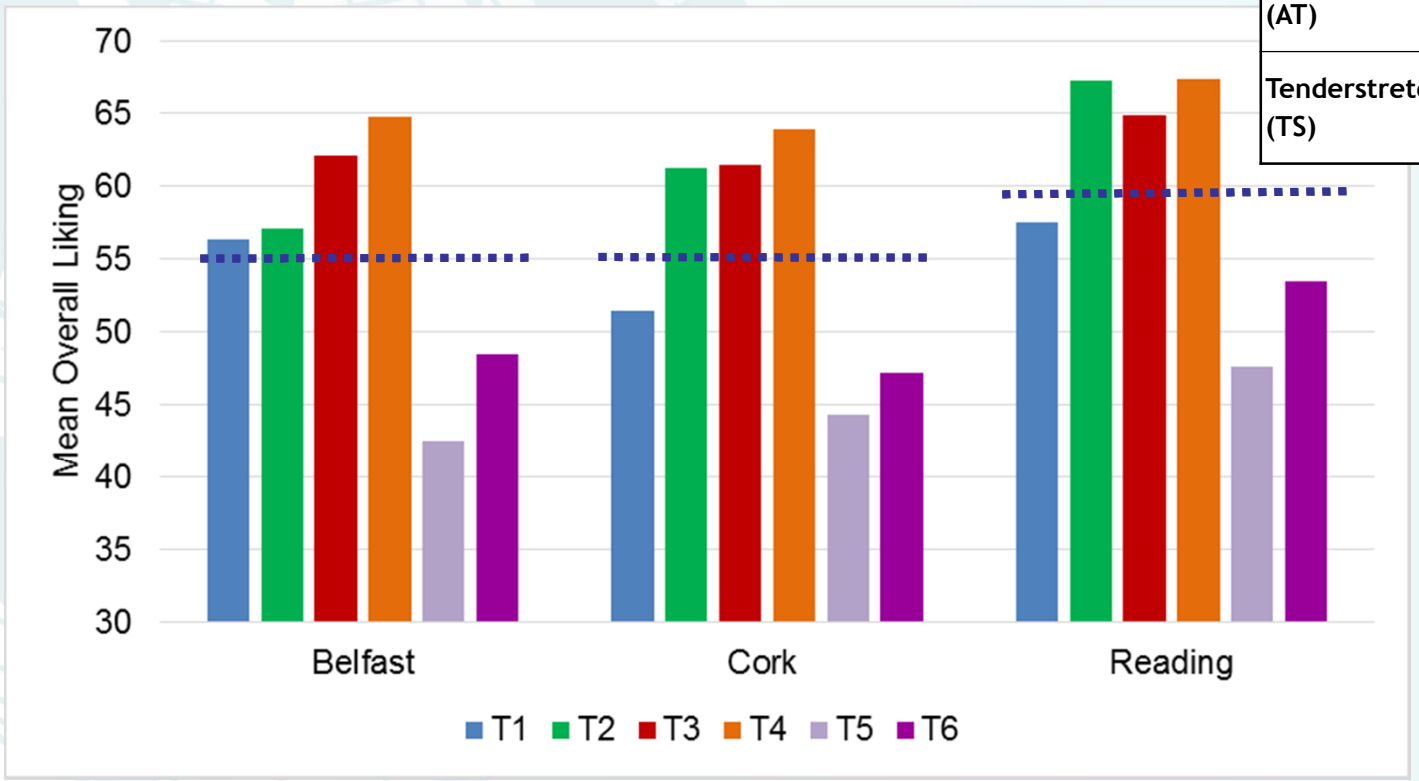
Examples

- Consumer panels - effect of region
- Trained panels - benchmarking
- Understanding why meat varies

Consumer panels

Three regions: NI, ROI, GB; beef - Overall Liking

Hanging method	Bulls	Steers	Old Cows
Straight Hung (AT)	T1	T3	T5
Tenderstretch (TS)	T2	T4	T6



afbi Agri-Food and Biosciences Institute

Do different regions like different things?
(360 consumers, 6 treatments)

	Treatment (n=6)	Region	Region * Treatment
Liking of aroma	**	***	ns
Tenderness	***	**	ns
Juiciness	***	*	ns
Flavour Liking	***	*	ns
Overall Liking	***	**	ns

* P<0.05, **P<0.01, ***P<0.001

… Regions like the same beef but score it differently.

afbi Agri-Food and Biosciences Institute

Why do GB consumers score higher??

- Different likes? X
- Use of line scale X
- Socio-demographic factors X
- Motivation for choosing beef ?
- Consumption habit Possible

afbi Agri-Food and Biosciences Institute

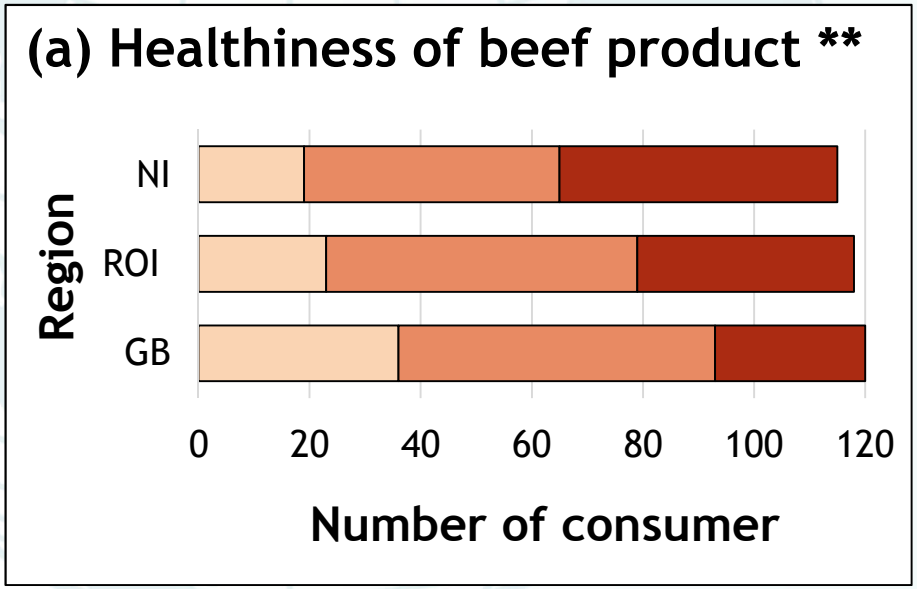
Motivation for beef choice

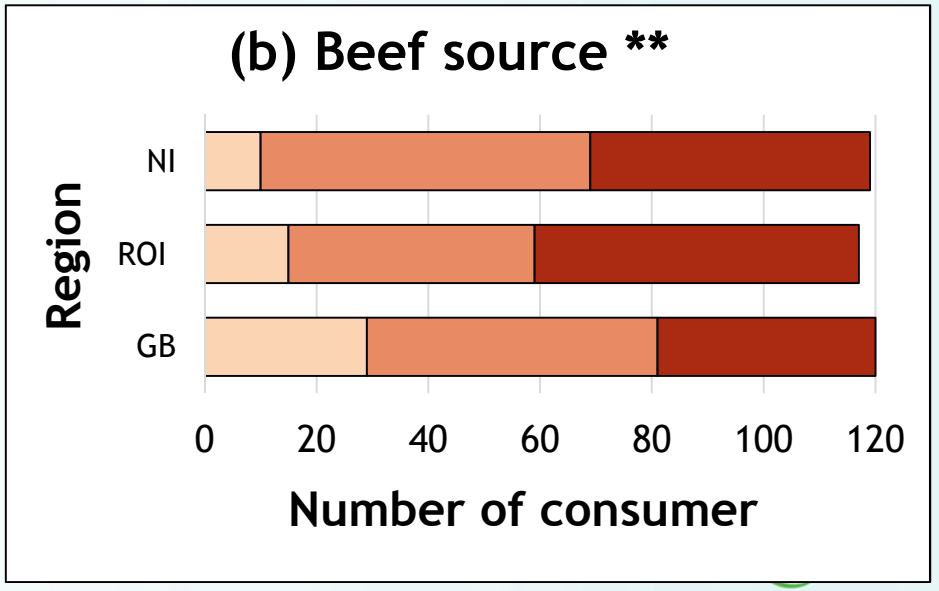
Not/Little important

Moderately important

Very important

**P<0.01

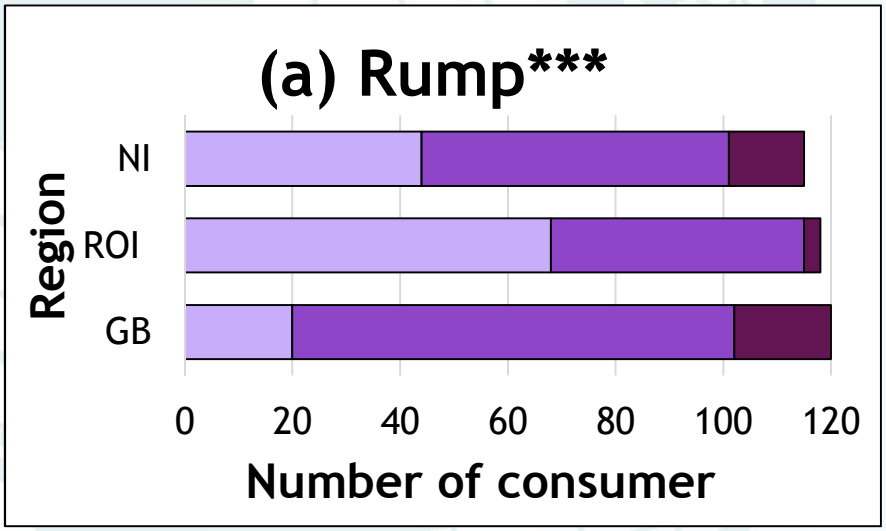


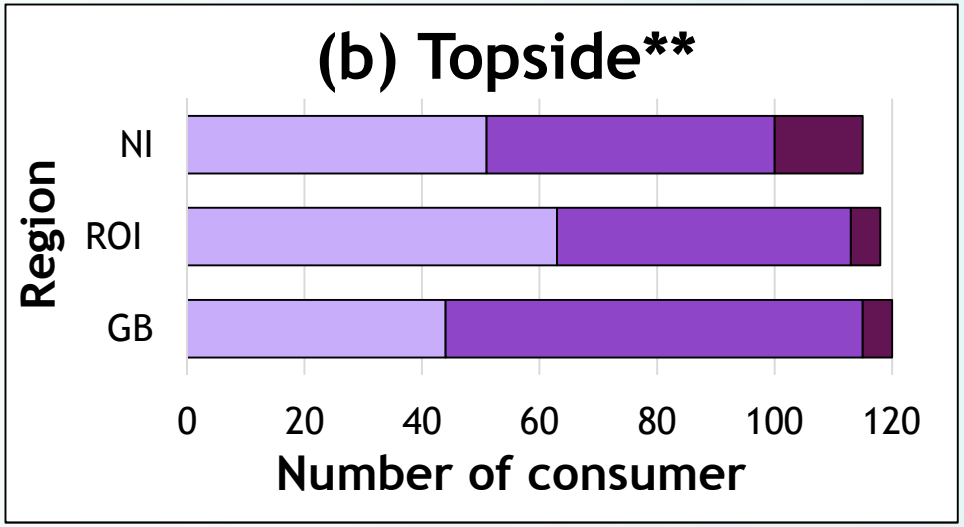


Consumption habits

Never Less than twice monthly Twice or more monthly

**P<0.01, ***P<0.001

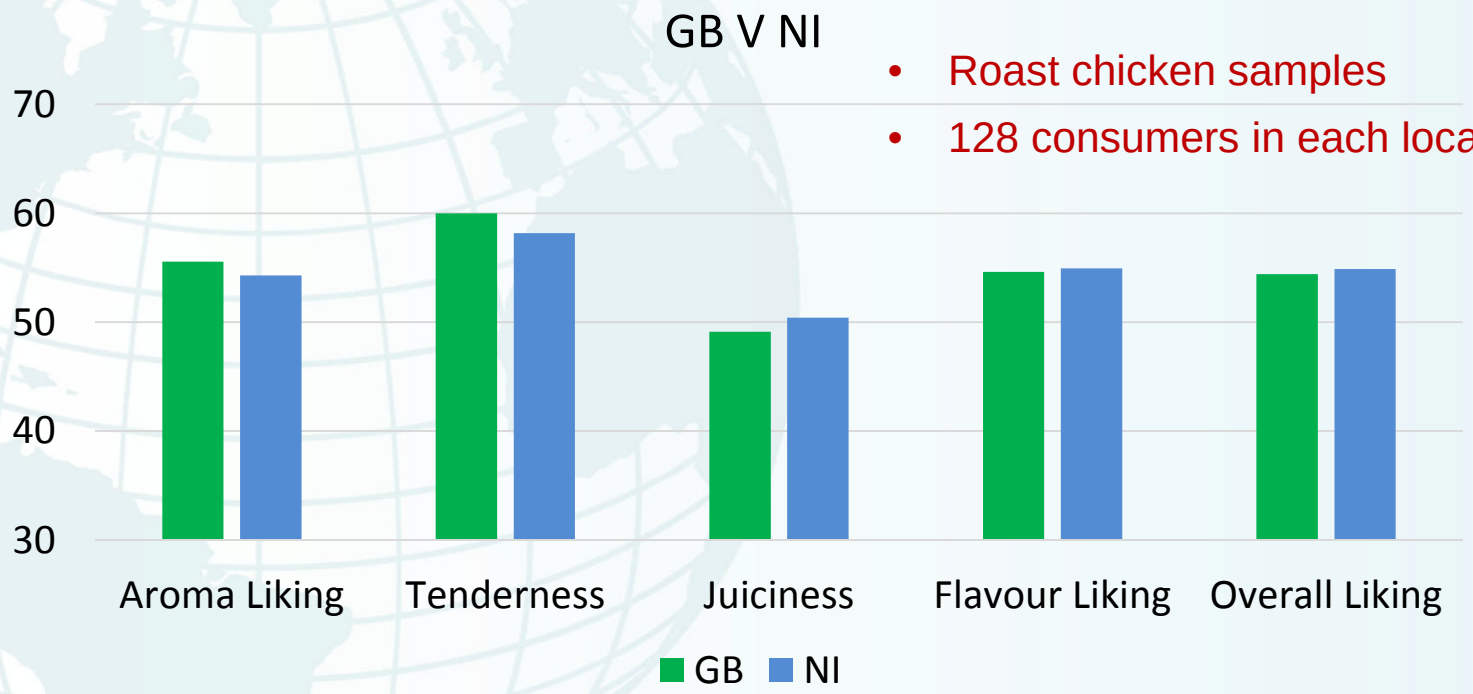




- Unsatisfactory: 25% of grilled rump and 53% of roasted topside (Farmer et al., 2016)

afbi Agri-Food and Biosciences Institute

Effect of region on consumer perceptions of chicken



- Roast chicken samples
- 128 consumers in each location

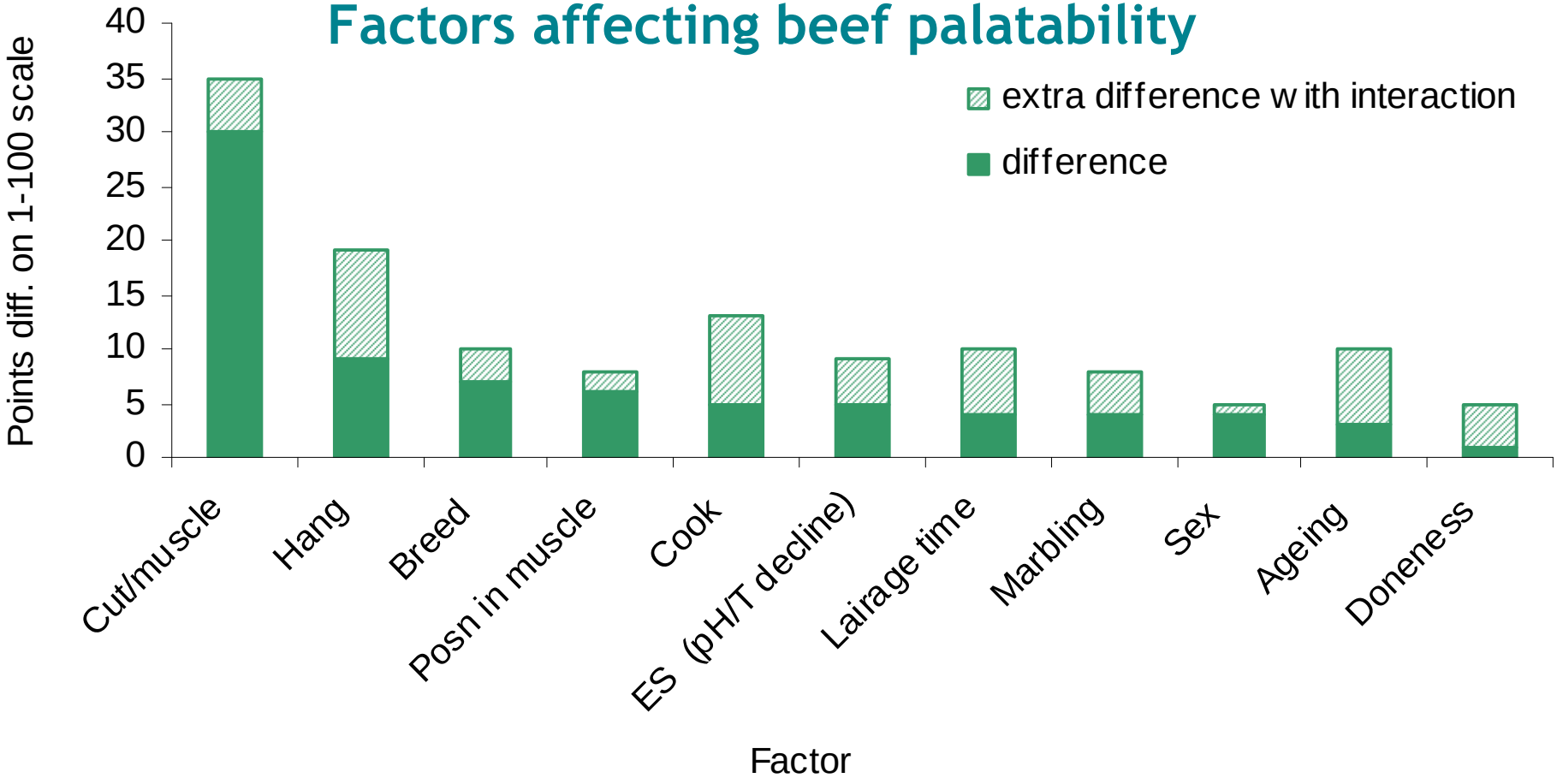
- No significant difference due to location or location * treatment

Findings:

- Region within the British Isles does not affect which beef/chicken people like.
- Different purchasing habits may influence average scores.
- NI/ROI consumer panels will reflect the answers from GB panels.

Consumer panels

Factors affecting beef palatability



Trained Panel

Beef Benchmarking Project

Commissioned by a major retailer

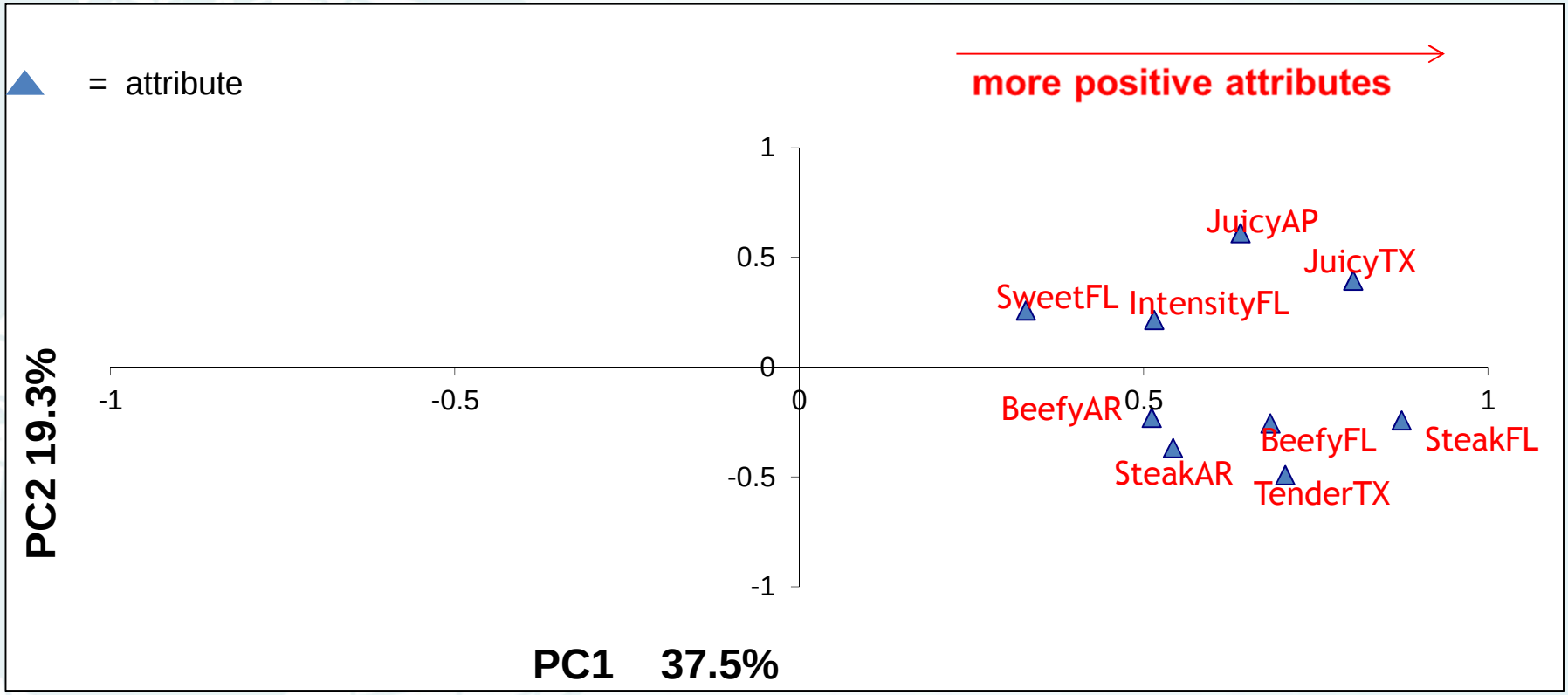
Objectives:

- To **internally** benchmark three of their own suppliers - A, B, C
- To **externally** benchmark their current sirloin steak products with three of their competitors - X, Y, Z

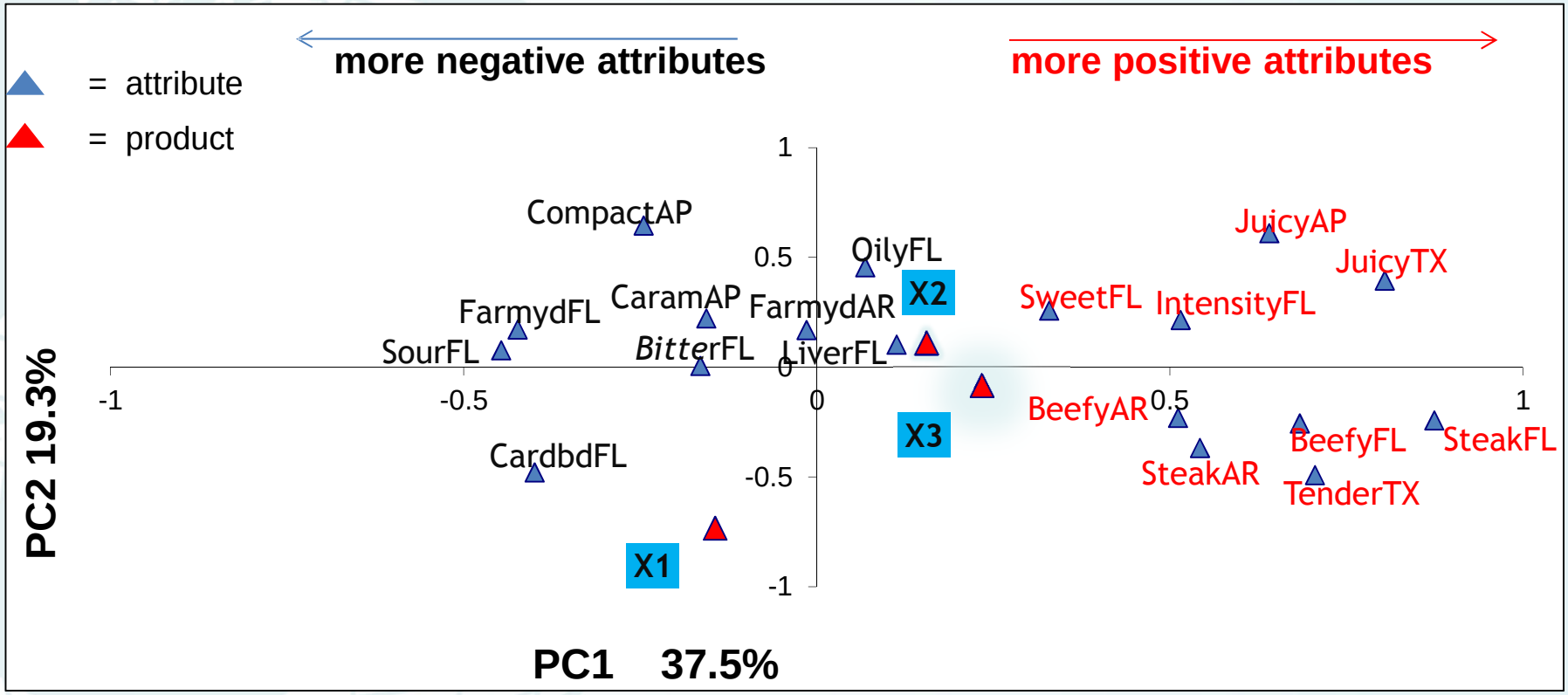
Trained sensory profiling panel developed descriptors

afbi Agri-Food and Biosciences Institute

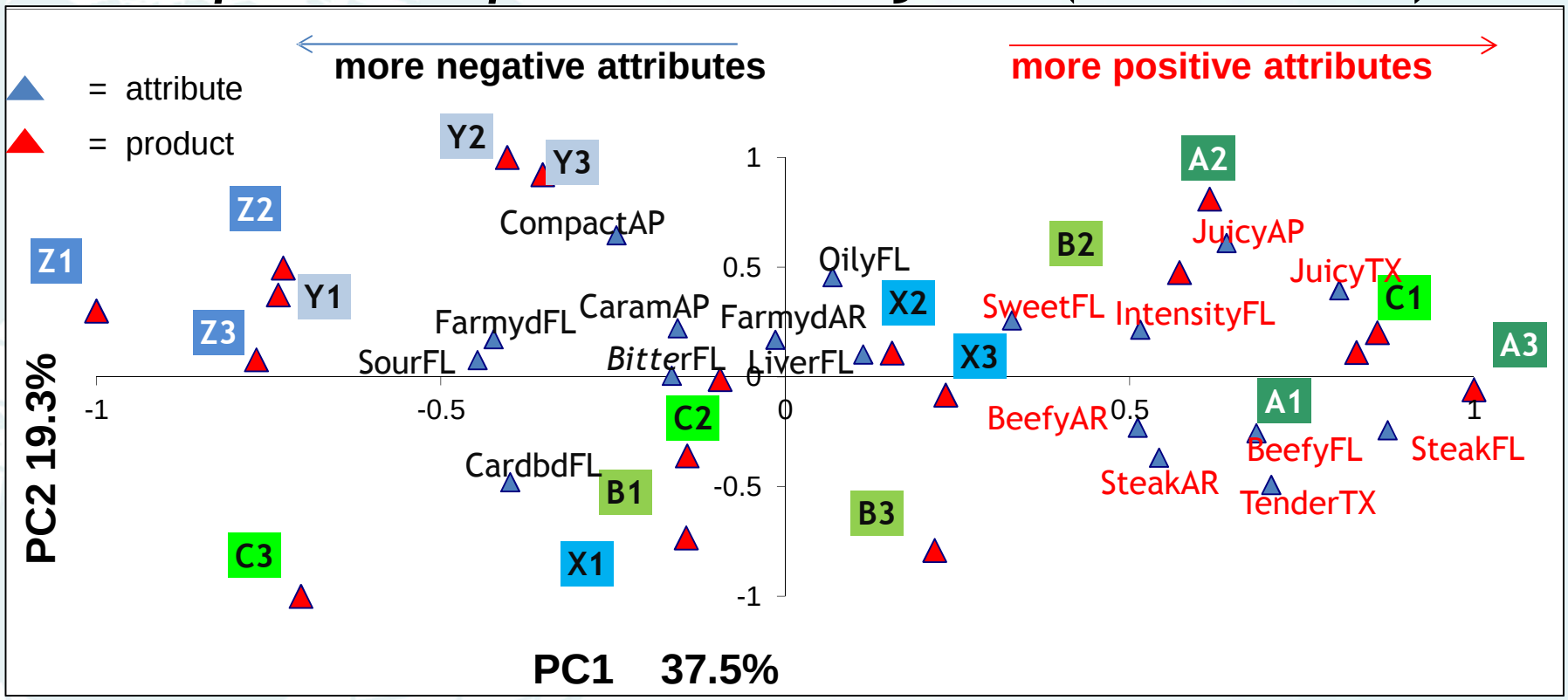
Principal Component Analysis (PC1v PC2)



Principal Component Analysis (PC1v PC2)



Principal Component Analysis (PC1v PC2)



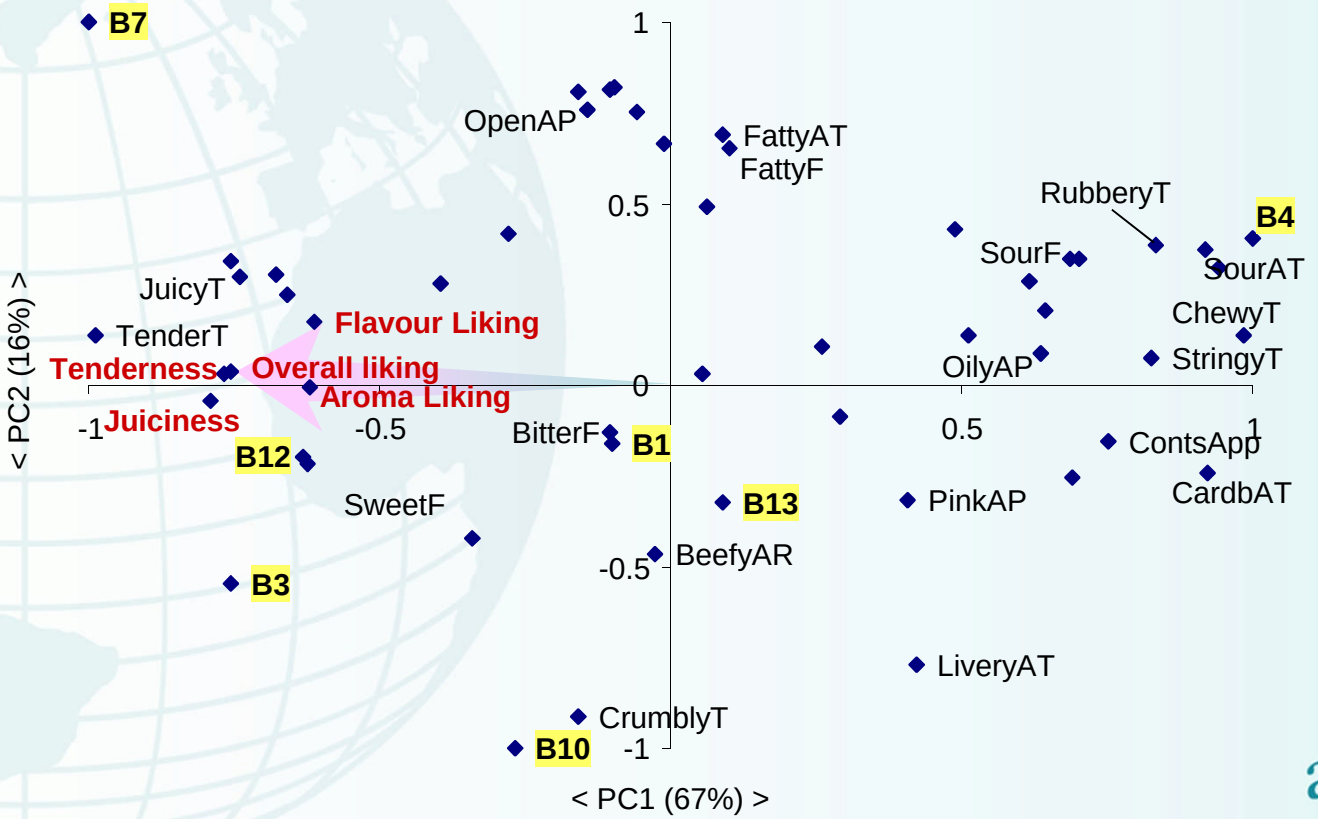
afbi Agri-Food and Biosciences Institute

Findings:

- There were significant differences between suppliers
- There were significant differences between the customer's product and their competitors
- The quality of the meat from one supplier varied significantly over a 3 week sampling period.

Understanding consumers

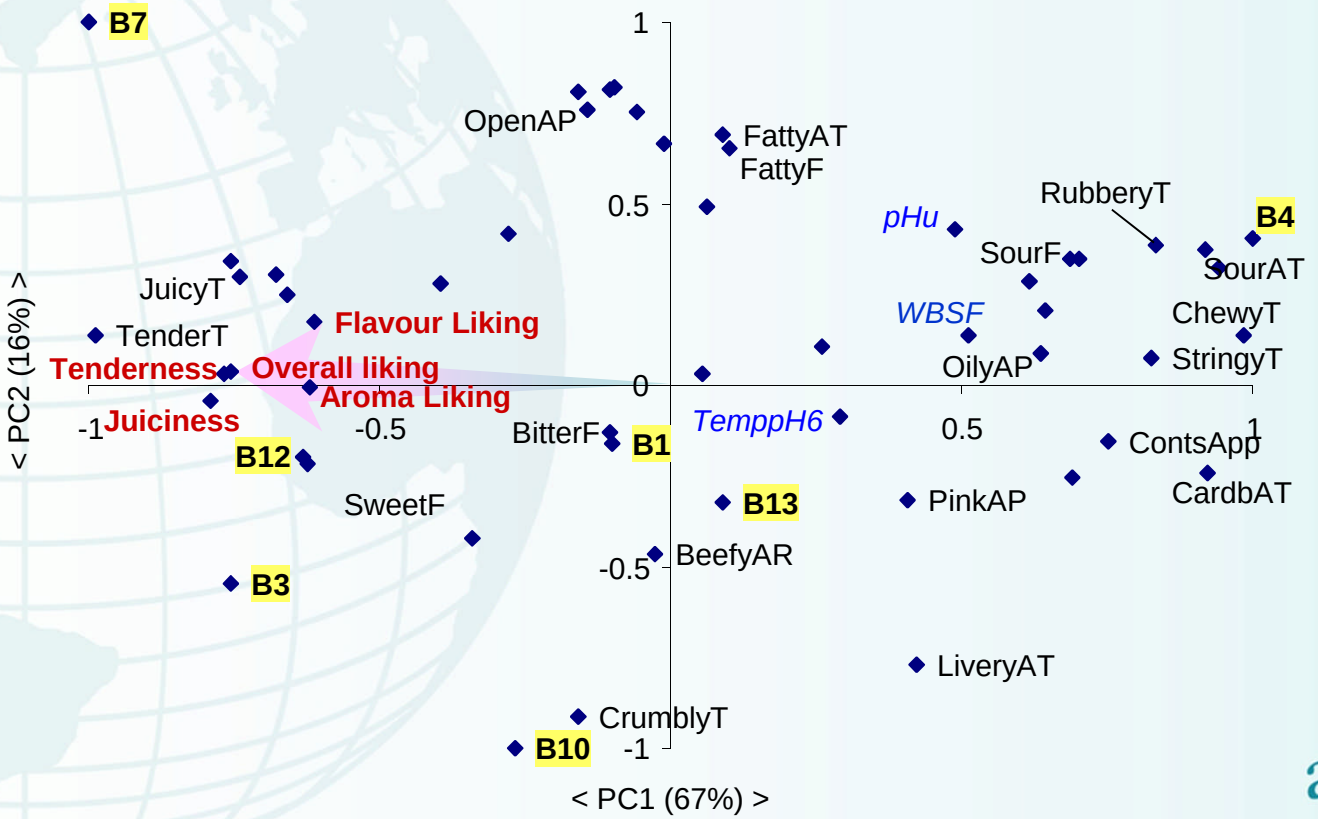
External preference map for grilled beef sirloin for principal components, PC1 and PC2



With consumer liking scores

Understanding consumers

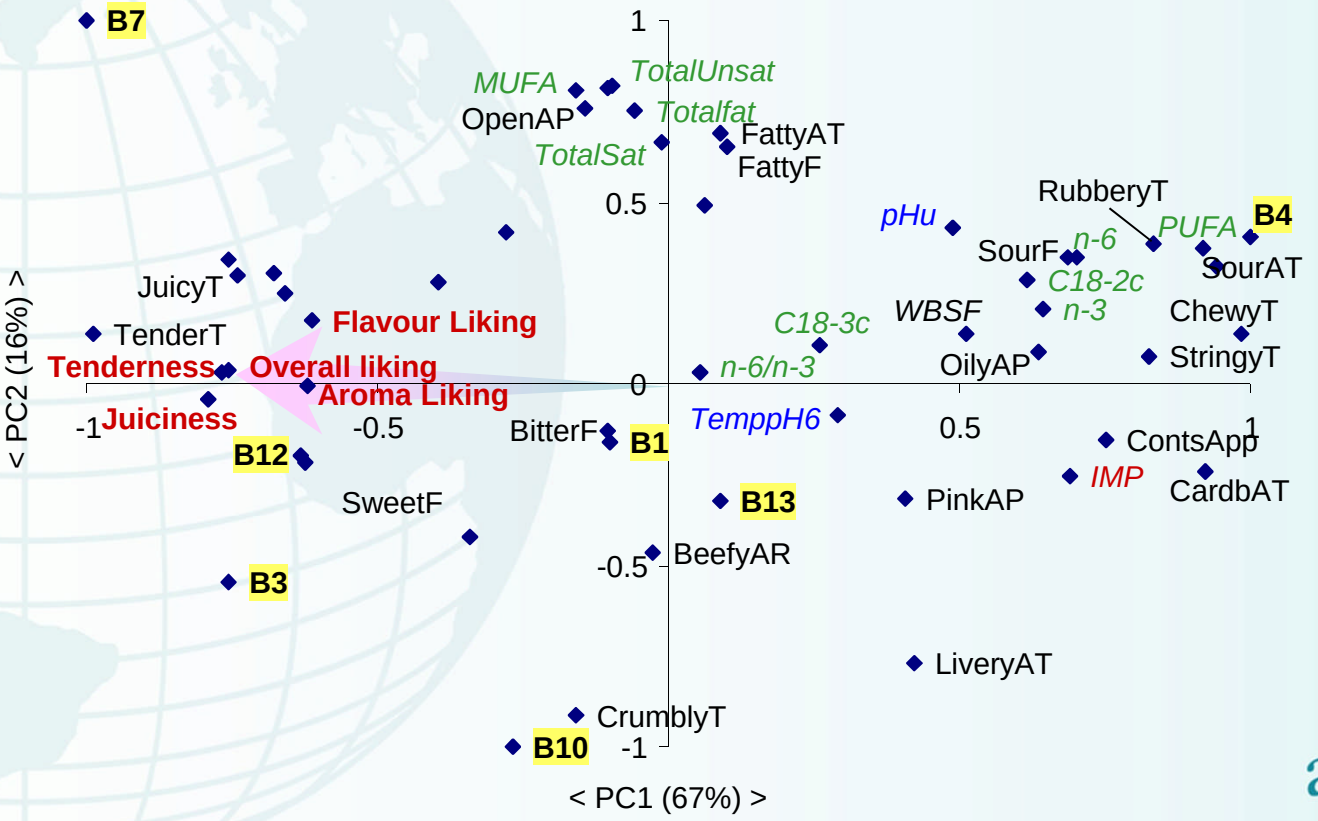
External preference map for grilled beef sirloin for principal components, PC1 and PC2



With meat quality measurements

Understanding consumers

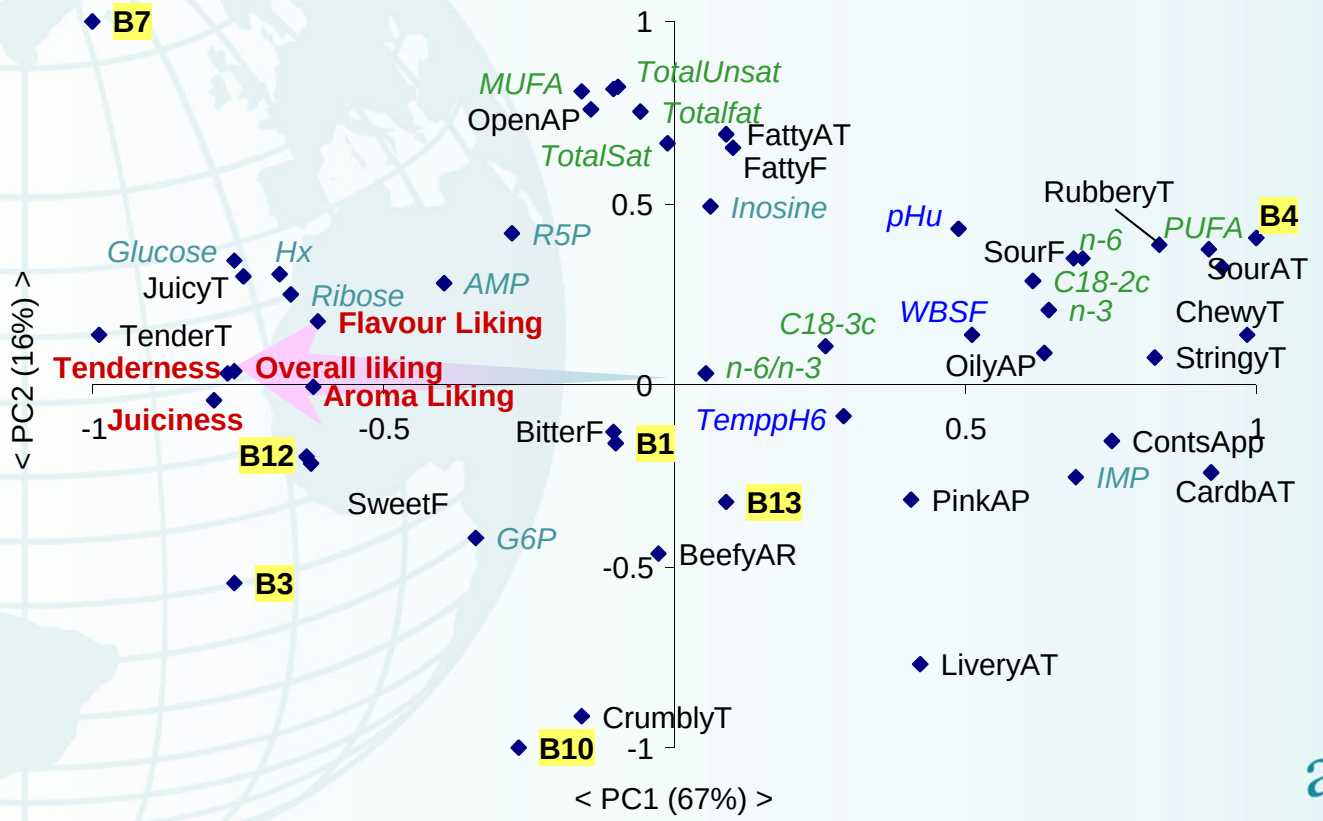
External preference map for grilled beef sirloin for principal components, PC1 and PC2



With fatty acid data

Understanding consumers

External preference map for grilled beef sirloin for principal components, PC1 and PC2



With other flavour precursors

Findings:

Consumer liking is linked to:

- Tenderness, juiciness, sweet flavour
- “Maillard” odour compounds
- Sugars and amino acids in raw meat

Consumer liking is opposite to:

- chewy, sour, cardboard
- High pHu, lipid-derived volatiles

Consumer liking can be understood!

afbi Agri-Food and Biosciences Institute

- All the ££ $$ €€ comes from the consumers

Conclusions

- Wide range of sensory methods available.
- Consumers and trained panels give different information.
- Importance of consumers >> consumer panels ↑
  - International/UNECE approved methods for compatible data
- Instrumental analyses can explain liking and/or attributes and provide markers/predictors.
- Chemometric/statistical methods ↑ to draw the information together.

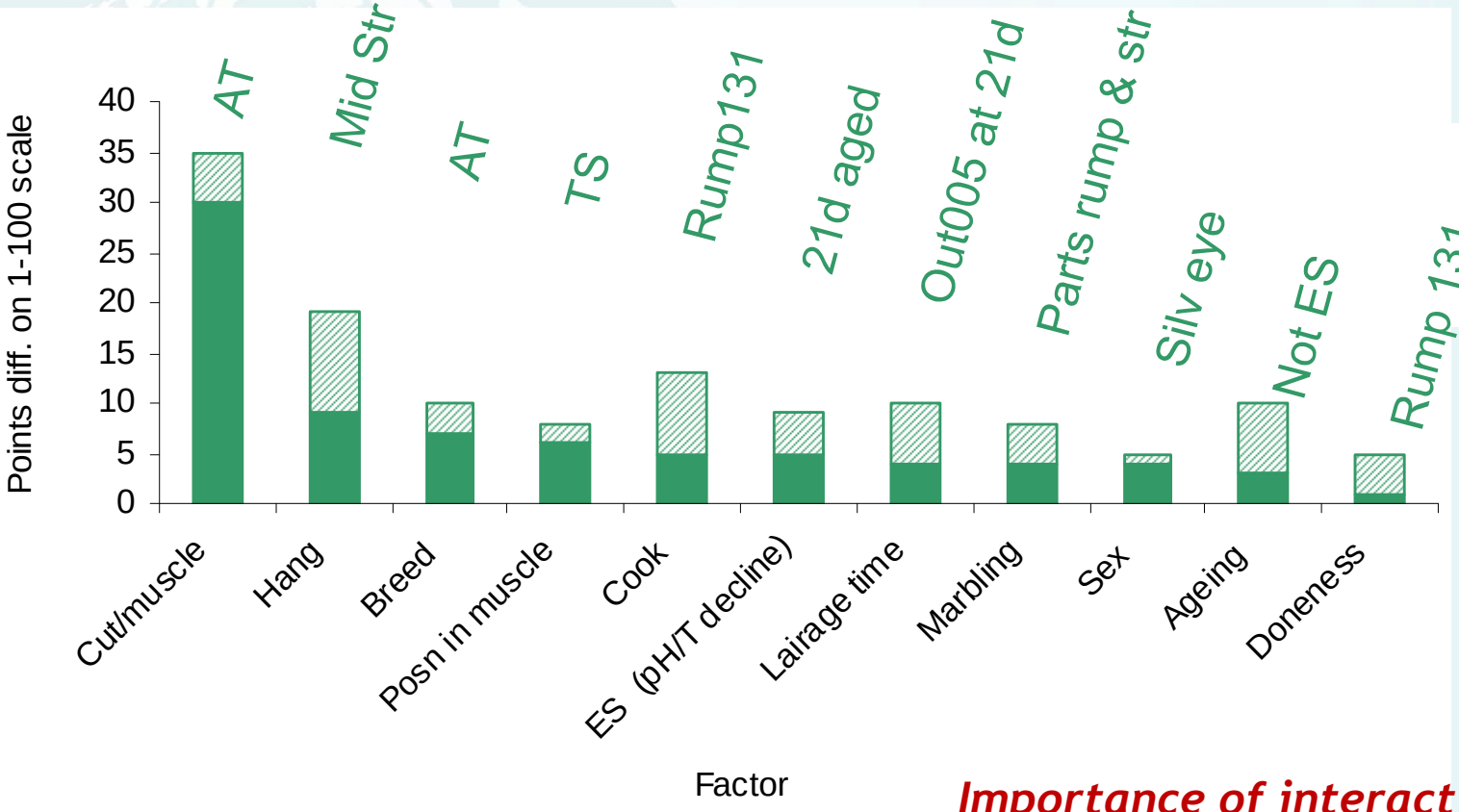
afbi Agri-Food and Biosciences Institute

Thank you

afbi Agri-Food and Biosciences Institute

Consumer panels

Factors affecting beef palatability



Importance of interactions