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CONSUMER NATIONALITY DOES NOT INFLUENCE BEEF EATING QUALITY RANKING IN EUROPEAN CROSS-COUNTRY TESTING

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I. INTRODUCTION

Beef eating quality ratings vary across markets, at least in part due to the lack of scientifically and standardised methodology in Europe, while consumer expectations remain largely consistent. Consumers expect a portion of beef they purchase to meet their meal expectations. The Meat Standards Australia (MSA) protocols and the 3G protocols for Europe, recognised by UNECE beef standards, have provided robust models for predicting beef eating quality using untrained consumers [1]. Previous research has shown significant effects of production system, muscle, and *post-mortem* handling on eating quality [2]. However, fewer studies have examined how consumer nationality influences the perception of the same beef samples [3,4]. Via the INTAQT project, this study aims to test whether consumers from France, Italy, and Poland rate the same beef samples differently, with the aim for one quality-based beef grading system in Europe. We hypothesised that nationality might influence taste preferences for beef, when the samples are controlled.

II. MATERIALS AND METHODS

A total of 38 beef striploin (STR045) samples from the INTAQT project were selected from 7 distinct production systems, covering animals from France, Italy, Spain, Wales, and Switzerland. Two steaks were taken from the anterior part of the striploin, aged for 10 days in a vacuum-packed prior to freezing. Using a unique anonymised code system identifying the animal and muscle position, the International Meat Research 3G Foundation managed the sensory design and distribution of paired samples to France, Italy, and Poland.
Consumer sensory testing followed the 3G protocols, where 60 consumers per country were recruited and screened. Each consumer scored 7 samples for tenderness, juiciness, flavour, and overall liking, using a 0–100 scale and assigned one quality grade for each sample (unsatisfactory, good, better and premium). A meat quality (MQ) score was calculated as: 0.3 × tenderness + 0.1 × juiciness + 0.3 × flavour + 0.3 × overall liking. Additionally, willingness to pay (WTP) was recorded after tasting to estimate consumer-perceived value. Ethical approvals were obtained for recruiting untrained consumers to participate in sensory sessions in each country, ensuring adherence to national and European ethical standards.
To assess cross-national differences, we used mixed linear models with sample ID as a random effect and Country as a fixed effect. Pairwise comparisons (France vs Italy, France vs Poland, Italy vs Poland) were conducted on the same samples. Data were analysed in R using the lsmeans and emmeans packages.

III. RESULTS AND DISCUSSION

Significant differences were observed in mean scores for juiciness, flavour, and overall liking across country pairs, particularly when comparing France and Poland, and Italy and Poland (Table 1). Polish consumers consistently gave higher ratings for all sensory traits compared to their French and Italian counterparts. For instance, mean flavour scores for Poland were significantly higher than both France ($p = 0.003$) and Italy ($p = 0.05$). Similarly, Polish scores for juiciness and overall liking were notably greater. In contrast, French and Italian consumers had on average a similar response to the paired samples, with no significant differences observed between them across any of the sensory traits.
Despite rating differences on average between France or Italy and Poland, a common trend was observed in the relative scoring of the samples: all three nationalities tended to rank samples similarly in terms of better or worse eating quality (Figure 1). This suggests that while perception thresholds may differ across Countries, consumers consistently recognised quality differences among samples. Polish consumers exhibited both higher average scores and a narrower score range, suggesting more homogeneous and generous evaluations.
In Figure 2, willingness to pay (WTP) responses revealed that the economic value assigned to eating quality differs across Countries, with Italian consumers attributing a lower €/kg value overall compared to French and Polish

consumers. However, the relative willingness to pay by eating quality level was consistent across all three Countries: consumers offered approximately half the base price for unsatisfactory samples, a 50% premium for better eating quality, and double the base price for premium-quality beef. This pattern suggests that while baseline meat prices differ, the perceived added value of improved eating quality is similarly recognised, reinforcing the feasibility of a unified eating quality grading system in Europe adaptable to local market structures.

Table 1 – Average eating quality scores given by untrained consumers on the same samples rated in the paired Countries.

Sensory traits - Raw scores	Mean (SD)						Pr > F		
	FR (n=130)	IT (n=130)	FR (n=140)	PL (n=140)	IT (n=110)	PL (n=110)	FR-IT (n=260)	FR-PL (n=280)	IT-PL (n=220)
Tenderness	54.0 (26.3)	54.5 (27.3)	58.7 (25.1)	62.3 (23.3)	49.9 (26.2)	57.4 (22.8)	0.86	0.34	0.06
Juiciness	43.1 (25.2)	48.3 (26.2)	42.1 (25.5)	63.6 (21.3)	46.1 (24.3)	61.2 (22.2)	0.10	<0.001	0.004
Flavour	53.9 (22.8)	53.1 (22.5)	55.4 (23.6)	67.3 (19.0)	54.4 (23.3)	62.2 (22.1)	0.80	0.003	0.05
Overall liking	50.5 (24.1)	54.6 (22.7)	53.4 (24.1)	66.9 (19.1)	52.0 (23.3)	61.2 (22.1)	0.25	0.002	0.03
Meat quality score	51.8 (21.9)	53.5 (21.9)	54.5 (22.2)	65.3 (18.0)	51.4 (21.1)	60.3 (19.9)	0.55	0.006	0.02

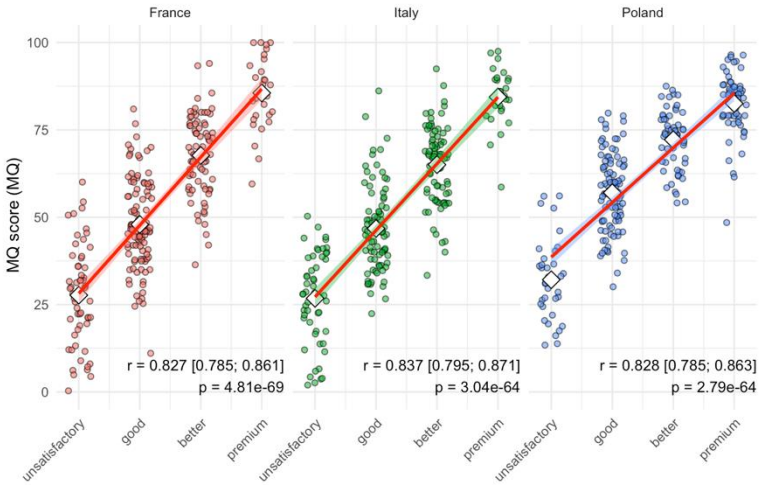


Figure 1. Comparison of mean MQ scores by country.

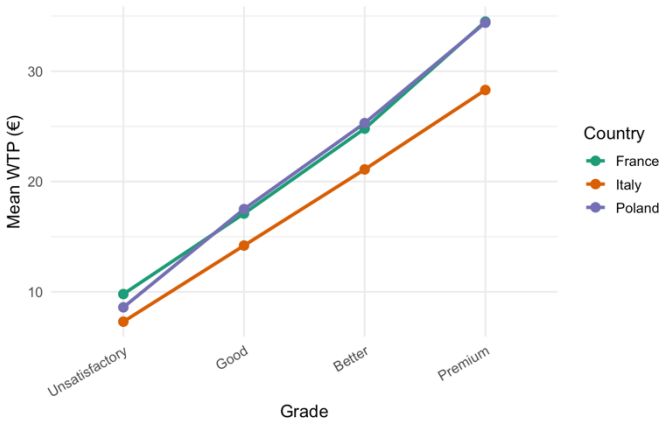


Figure 2. Willingness to pay (WTP) by Country.

IV. CONCLUSION

These findings align with earlier work from Hocquette *et al.* [3] and Bonny *et al.* [4], emphasising similar ranking of beef samples while demonstrating the role of cultural background in shaping sensory experiences. They reinforce the need for beef grading systems to be both standardised and adaptable—providing reliable eating quality information while accounting for regional consumer preferences. A better understanding of consumer-specific preferences can help the beef industry optimise product allocation and value capture across European markets.

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