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Consumer preferences for beef with specific reference to fat colour: The case of Cape Town, South Africa

F.A. MARÉ¹, P.R. TALJAARD¹, H. JORDAAN¹

ABSTRACT

Various consumer perceptions exist about white and yellow beef fat. These perceptions subsequently affect the price of beef with yellow or white fat. Although only 25% of South African beef is grass-fed (yellow fat), lower prices offered for yellow fat result in farmers potentially receiving about R157.5 million less income per year. This study determined consumer preferences for beef fat colour in the Cape Town area of the Western Cape, South Africa. The largest percentage (43.74%) of consumers preferred white fat, followed by consumers (42.68%) to who fat colour did not matter and those who preferred yellow fat (13.59%). Analysis of the different consumer groups found that consumers who preferred yellow fat were buyers with higher education levels. These consumers were more concerned about the physical visual properties of the meat than about the branding, classification and packaging neatness. Consumers who preferred white fat had lower education levels, were more concerned about the packaging neatness and grade, and did not care much about the physical visual properties of the meat. Rather than discriminating against the price of yellow fat beef, a niche market could be created to accommodate this product.

KEYWORDS: Beef fat colour; consumer preference; yellow fat; white fat

1. Introduction and background

Various consumer perceptions exist about white and yellow beef fat. A perception that consumers disliked yellow fat, especially those in European markets, may have followed the research of Morgan et al. (1969). Yellow fat in beef carcasses was also less acceptable for domestic (Australian) and export markets than whiter fat (Walker et al., 1990). Some consumers in Japan equate yellow fat with disease (Young and Kauffman, 1978). Forrest (1981) stated that consumers in North America (United States of America [USA] and Canada) became accustomed to the white fat of feedlot finished cattle, an established practice since the 1970's.

More recent studies in international markets sketch a different picture. Lusk et al. (2008) find that the market share implied from incentive compatible, non-hypothetical conjoint ranking is higher for beef with yellow fat (pasture fed market share = 52.43%) than for beef with white fat (conventional market share = 47.57%) in the south-eastern parts of the USA. The consumer thus developed a higher preference for pasture fed beef with yellow fat. Umberger et al. (2002) find that 23% of the participants in their study prefer yellow fat beef (grass-fed) and is willing to pay a premium for it. Consumers in France, Germany and the United Kingdom also place a higher value on beef from cattle that are not grain-fed, and thus prefer yellow fat from grass-fed animals (Lusk et al., 2003).

In the USA two studies explicitly investigated consumer preferences for type of fat in beef. Lusk et al. (2008) conducted non-hypothetical purchasing experiments with consumers in grocery stores to determine the value they placed on grass-fed beef, while McCluskey et al. (2005) administered a consumer survey in several grocery stores to determine relative preferences for beef price, fat and calories, and level of omega 3 fatty acids. Participants in the beef industry are continually interested in improving the competitive position of beef relative to other protein sources, and therefore it is important to know consumer preferences regarding the fat colour of beef so that marketing can be handled accordingly.

According to Strydom and Hugo (2008) no information about consumer preferences for beef fat colour exists in South Africa. South African consumers tend to select beef for purchase on the basis of quality, price and convenience of location (Vermeulen and Biénabe, 2010).

Due to the perception that the South African consumer dislikes yellow-coloured fat, the abattoirs in South Africa discriminate against the carcass price of cattle with yellow fat. According to Strydom and Hugo (2008), a discount of 30 to 40 cent per kg is incurred on yellow fat in the Northern Cape, while a penalty of R2 per kg is incurred in the Western Cape for yellow fat carcasses (Dürr, 2008). One of the leading abattoirs in the Northern Cape use no fixed discount on carcasses with yellow fat, but they discount the price with about

50 cent per kg if an A-grade carcass has yellow fat (Lockem, 2009). The discount on carcasses with yellow fat stays on a fixed Rand² value, and not a percentage of the carcass price, although the differentiation of the carcass price occurs on a weekly basis. The same principle is used for different carcass grading according to age and the amount of fat. The difference in Rand between the price of an A2 and B2 carcass basically stays the same (with small differences of a few cent either way) regardless of the price of an A2 carcass for any given week.

The economic impact of lower prices offered for beef with yellow fat has a major influence on the income of the beef farming sector in South Africa. In South Africa about 630 000 tons of beef is produced annually (GIRA, 2007) and approximately 75% of the total beef production come from feedlots (Grant et al., 2004; Esterhuizen, 2008). This means that 25%, or 157 500 tonnes of grass-fed beef with yellow fat enters the market every year. The grass-fed beef that enters the market do not only consist of A-grade carcasses as in the case of the feedlot animals. If the price discrepancy between yellow and white fat on beef is R1 on average, the farmers in South Africa potentially receive about R157.5 million less income each year.

The aim of this paper is to investigate consumer preferences for beef fat colour. Firstly the origin and nutritional quality of white and yellow fat is described. Secondly, consumer preferences affecting purchasing decisions with regard to white or yellow fat are determined. Thirdly, a regression analysis is used to identify the characteristics of consumers who prefer a specific beef fat colour.

The origin and nutritional quality of white and yellow fat

Feedlots gained prominence after World War II, when the post-war oversupply of grain was fed to cattle. This trend continued for more than 50 years resulting in beef with whiter fat from the grain fed diet (McCluskey et al., 2005). In South Africa, cattle are grainfed in order to ensure beef that is tender and lean (South African Feedlot Association, 2012).

Palmer and Eckles (1914) found that cattle grazing succulent forages tended to have yellower-coloured fat. The fat-soluble carotenoid pigments absorbed from the diet is normally the cause of yellow fat and is commonly attributed to pasture feeding (Hill, 1968, as cited by Strydom and Hugo, 2008). Young and Kauffman (1978) state that although leaf colour is usually dominated by chlorophyll, lush green pasture contains up to 500µg carotenoids/g dry weight, whereas dry pasture or cut hay contain less than 50µg/g. Grains usually contain less than 5µg/g. Although the specie of the animal and the age of the animal (older animals tend to have a yellower fat colour) may also play a role in the fat colour, the effect of these factors is not as prominent as the effect of feeding practices (Strydom and Hugo, 2008).

Animals fed on pastures (grass) thus usually tend to have a creamier (yellow) fat colour than animals that are grain fed, due to high carotenoid values in green

pastures. McCluskey et al. (2005) classify grass-fed beef as either organic or natural beef, depending on the production practices. Hormones and antibiotics are usually not administered to grass-fed animals. Studies on the fatty acid composition of grass-fed steers found that an increasing amount of grass intake decreased intramuscular saturated fatty acids. A higher grass intake also increased the omega 3 fatty acid concentration and decreased the omega 6 to omega 3 ratio (French et al., 2000; Scollan et al., 2006). McCluskey et al. (2005) indicate that the overall fat content of grass-fed beef is similar to that of skinless chicken, and that the higher levels of essential fats (omega 3 fatty acids) are beneficial in preventing or treating heart disease, stroke and possibly auto-immune problems such as lupus, eczema and rheumatoid arthritis.

Grass-fed beef (beef with yellow fat) is a product with several health benefits that may appeal to health-conscious consumers. As consumer preferences evolve, it is important for the beef industry to understand those preferences for speciality products such as grass-fed beef.

2. Methodology

The survey was undertaken in March 2009 in the Cape Town area of South Africa. This area was specifically identified because of the large amount of cattle that are grass- or pasture-fed in this area. The Cape Town region is a winter rainfall area suitable for fattening cattle on pastures during winter. The study was conducted over a period of 6 days (Monday to Saturday) in and around different supermarkets in the Cape Town region during normal shopping hours (08:30 to 18:00). This ensured that a range of clients (working and non-working) could be included in the survey. The random walking method was used so that the random character of the sampling was ensured. Face-to-face interviews were conducted and people older than 15 years of age had an equal chance to be included in the survey. In total, 471 consumers were interviewed about their perceptions and preferences regarding beef. The questionnaire³ used in the interviews consisted of a combination of closed answers, Likert type scales and options where the consumer ranked his/her choices in level of importance.

Consumers rated 11 criteria that influenced their beef purchasing decisions using a score of 1 to 5, indicating unimportant to very important. The 11 criteria were subsequently arranged from most important to least important. Consumers were also asked to rate the aspects of beef that most negatively influenced their choice using a score of 1 to 6, indicating aspects that most influenced their choice to the aspect that least influenced their choice. The aspects were subsequently arranged from biggest influence to smallest influence.

Data were processed using SPSS Statistics 17.0 for Windows and Microsoft Excel to calculate the inferential statistics. The different factor rankings of the groups are represented in radar charts. Simetar 2008 for Microsoft Office was used to perform logit regression models on the different preference groups. Two logit regression models were run using consumers who prefer

² In mid-March 2013 the approximate value of 1 South African Rand (R) was \$US 0.11, £0.07, and €0.083.

³ Details on the questionnaire are available from the corresponding author.

white fat as the dependant variable (Prefer white fat =1; Not prefer white fat =0) in the one regression, and consumers who prefer yellow fat as the dependant variable (Prefer yellow fat =1; Not prefer yellow fat =0) in the other regression.

3. Results and Discussion

Table 1 gives a descriptive summary of the survey statistics as recorded from the random questionnaire sampling. Most of the consumers were between 15 and 45 years of age, while the gender was equally distributed between male and female. The consumers were distributed among all the income groups with a mean income level of R3201-R6400. Blacks (29.3%), Coloureds (39.7%) and Whites (28.9%) made up most of the population with only a very small percentage of Indians (0.8%) and Asians (1.3%).

Table 2 gives the consumers' income and monthly expenditure on groceries. Most consumers earned R1601-R3200 (20.4%) or R3201-R6400 (18.0%). The

questionnaire survey showed that 8 consumers out of ten (83.23%) consumed beef. Vermeulen and Biénabe (2010) found that 76% of middle to high-income South African consumers purchased beef steak. Without indicating the difference between yellow and white fat, the consumers were asked what fat colour they prefer. The response was that 43.74% of the consumers preferred white fat, 13.59% preferred yellow fat, while 42.68% indicated that the fat colour of beef did not matter to them. In the survey of Vermeulen and Biénabe (2010), 7% (n=420) of consumers considered fat content the most important factor when purchasing beef steak; fat colour was not taken into consideration in the survey.

Consumer preferences for meat in general

The criteria influencing consumers' decisions when purchasing meat is given in Table 3 and visually represented in Figure 1 in terms of the mean score for each criterion. From Figure 1 it is clear that the

Table 1: Summary statistics of demographic variables

Variable	Coding	Description	Distribution of survey responses (N=471) ¹		Population statistics for the Western Cape province ^{2,3} (n=4 524 335)
Age	1	15-25 years	27.6%	Mean=2.6 SD=1.4	15-19 years: 9.9%
	2	26-35 years	27.0%		20-24 years: 9.5%
	3	36-45 years	21.4%		25-29 years: 9.4%
	4	46-55 years	14.2%		30-34 years: 8.71%
	5	56-65 years	5.7%		35-39 years: 8.0%
	6	66-75 years	3.2%		40-44 years: 6.8%
	7	>75 years	0.8%		45-49 years: 5.3%
Gender	1	Male	48.2%	Mean=2.4 SD=0.8	50-54 years: 4.2%
	0	Female	51.8%		55-59 years: 3.1%
Education	1	Primary School or lower	7.6%	Mean=3.7 SD=1.9	60-64 years: 2.6%
	2	Secondary School	59.6%		65-69 years: 1.9%
	3	University or College	23.5%		70-74 years: 1.4%
	4	Post-Graduation Course	9.3%		75-79 years: 0.9%
Marital Status	1	Married	42.5%		80-84 years: 0.5%
	0	Single	57.5%		85+ years: 0.4%
Number of persons in household	1	1 person	11.9%	Mean=3.7 SD=1.9	2 192 321
	2	2 persons	18.7%		2 332 014
	3	3 persons	17.0%		28.8% ⁴
	4	4 persons	23.8%		59.9% ⁵
	5	5 persons	12.5%		11.2% ⁶
	6	6 persons	6.4%		-
	7	7 persons	4.7%		49.2% ⁷
	8	>7 persons	5.1%		51.8% ⁸
Race	1	White	28.9%		-
	2	Black	29.3%		19.4%
	3	Asian	1.3%		3.4%
	4	Coloured	39.7%		4.0% ⁹
	5	Indian	0.8%		61.1%

¹Mean and standard deviation (SD) of coding, ²Statistics South Africa (2005), ³Education pertains to person aged 20 years and older,

⁴Includes: No schooling, Some primary, Complete primary, ⁵Includes: Some secondary, Grade 12, ⁶Higher, ⁷Includes: civil, religious and traditional marriages, ⁸Includes: never married, widowed, divorced, separated or other, ⁹National census combines Indian and Asian. Thus 4.0% includes both groups

Table 2: Summary of consumers' income and expenditure on groceries

Variable	Coding	Description	Distribution of survey responses (N=471) ¹		National Statistics for the Western Cape ²
Monthly Income	1	R0-800	8.5%	Mean=4.0 SD=1.8	No income: 2.0%
	2	R801-1600	13.8%		R1-400: 6.5%
	3	R1601-3200	20.4%		R401-800: 17.7%
	4	R3201-6400	18.0%		R801-1600: 25.1%
	5	R6401-12800	15.9%		R1601-3200: 20.1%
	6	R12801-25600	12.5%		R3201-6400: 15.2%
	7	R25601-51200	8.9%		R6401-12800: 8.3%
	8	>R51200	1.9%		R12801-25600: 3.4%
Persons contributing to income	1	1 person	35.0%	Mean=2.0 SD=1.1	R25601-51200: 1.1%
	2	2 persons	43.5%		R51201-102400: 0.4%
	3	3 persons	12.1%		R102401-204800: 0.2%
	4	4 persons	6.2%		R204801 or more: 0.1%
	5	5 persons	1.3%		-
	6	6 persons	0.8%		-
	7	7 persons	1.1%		-
	8	>7 persons	0.0%		-
Monthly Expenditure on Groceries	1	R0-1000	29.7%	Mean=2.5 SD=1.4	-
	2	R1001-2000	27.2%		-
	3	R2001-3000	21.2%		-
	4	R3001-4000	11.5%		-
	5	R4001-5000	7.1%		-
	6	R5001-6000	2.5%		-
	7	R6001-7000	0.4%		-
	8	>R7000	0.4%		-

¹Mean and standard deviation (SD) of coding, ²Statistics South Africa (2005)

sequence of criteria importance almost followed an exact pattern for the consumers who preferred white fat and those to whom fat colour did not matter, while the criteria importance pattern for the consumers, who preferred yellow fat, differed.

For the consumers who preferred white fat and for those to whom fat colour did not matter, the sell by date of meat was the most important criterion when buying meat, and branding the least important. According to the rest of the criteria, the consumers who preferred white fat and those to whom fat colour did not matter had an almost identical ranking, except for the neatness of the cuts that was more important to consumers preferring white fat than the presence of blood in the packaging. For the consumers to whom fat colour did not matter these two criteria were just the opposite. Consumers who preferred white fat and for those to whom fat colour did not matter placed a higher value on the price, neatness of packaging, neatness of cuts and the presence of blood in the packaging than on the physical properties such as the meat colour, fat and fat distribution, texture, classification and the thickness of the cuts. The price of the product was the second most important criterion for these two groups.

The group of consumers that preferred yellow fat had a different ranking of the criteria although the sell by date of meat was also the most important criterion when buying meat, and branding the least important. This group was more concerned about the meat's physical properties than the packaging and appearance. The

second most important criterion was the texture of the meat, followed by the neatness of the cuts, meat colour, neatness of the packaging, and fat and fat distribution.

Fat and fat distribution was in sixth place for the consumer group who preferred yellow fat, and seventh for the other two groups. Additionally, the importance of price was placed seventh by the group preferring yellow fat and second by the other two groups. Blood in the packaging was also much less important to the group who preferred yellow fat, while the thickness of cuts and the classification was more important.

Consumer preferences for beef

The ranking for beef aspect preferences is given in Table 4 and graphically demonstrated in a radar chart (Figure 2). Figure 2 is drawn using the ranking of each aspect in Table 4, which received the highest score (highlighted in Table 4). The important aspects for consumers who preferred yellow fat and consumers to whom fat colour did not matter followed the same pattern, although the value placed on each aspect differed. The important aspects for consumers who preferred white fat followed a different pattern than the other two groups.

Price had the biggest negative influence on the consumers' decision when purchasing beef in all three groups. Bone content had the least influence on the purchasing decision of all the consumers.

The consumers that preferred white fat placed grade as the aspect with the second highest influence, followed

Table 3: Importance of choice criteria influencing consumers' decisions when purchasing meat

Order ¹	Criteria	Consumers who prefer white fat			Consumers who prefer yellow fat			Consumers to whom fat colour does not matter		
		N	Mean	Standard deviation	N	Mean	Standard deviation	N	Mean	Standard deviation
1	Sell by date	206	4.60	0.96	64	4.69	0.71	194	4.60	0.91
2	Price	206	4.42	1.04	64	4.34	0.82	194	4.37	0.98
3	Neatness of packaging	206	4.36	0.94	64	4.33	1.04	194	4.26	0.99
4	Neatness of cuts	206	4.36	0.97	64	4.27	0.91	194	4.20	1.04
5	Blood in packaging	206	4.36	1.02	64	4.22	1.12	194	4.16	1.02
6	Meat colour	206	4.30	0.99	64	4.19	1.01	194	4.14	1.12
7	Fat and Fat distribution	206	4.17	1.15	64	4.17	1.06	194	4.04	1.17
8	Texture	206	4.00	1.09	64	4.06	1.08	194	3.92	1.05
9	Classification	206	3.84	1.24	64	4.06	1.08	194	3.75	1.20
10	Thickness of cuts	206	3.78	1.13	64	4.05	1.12	194	3.73	1.03
11	Branding	206	3.68	1.29	64	3.36	1.24	194	3.72	1.11

¹The 11 criteria arranged from most important to least important

by fat content, fat colour and meat colour. This group of consumers focussed more on the information on the package than on the physical properties of the meat. It was interesting how important the grade was to this consumer group and it seemed if they relied almost completely on the grade to describe the quality of the beef.

The consumers who preferred yellow fat and those to whom fat colour did not matter placed a higher value on the physical properties of the meat and for both groups the grade of the meat was in second place. The group that preferred yellow fat placed a higher value on the meat colour than on the fat content, while for the group to whom fat colour did not matter it was the opposite. The very high rating of meat colour in these groups, against the low rating of grade, illustrated that these consumers relied more on the physical properties of the beef to determine the quality.

All three groups placed fat colour in the third place and according to the percentage of votes it is more likely to become less important than more important. Fat colour can thus not be seen as an important determinant when considering beef because of the consumers' low rating.

Regression statistics for beef fat colour preferences

Two logit regressions were done with preference for yellow fat as dependant variable in the one regression and preference for white fat in the other. The logit regression statistics in Table 5 represent the variables that were significant to a 10% ($\alpha=0.10$) level of significance for yellow fat and white fat preferences.

For the consumers who preferred yellow fat, an increase in groceries expenditure, favourite meat expenditure and education would lead to an increase in the preference for yellow fat. An increase in the number of persons in the household, expenditure on meat, importance of the sell by date and the number of meals away from home would lead to a decrease in the preference for yellow fat. The consumers who preferred yellow fat were better educated, spent more money on groceries and meat, were particular about the freshness of the product and prepared most of their meals at home.

The regression on preference for white fat showed that an increase in education and the importance of meat colour would lead to a decrease in the preference for white fat. An increase in age, income and the amount spent on favourite meat would lead to increasing preference for white fat. The consumers that preferred white fat were thus not as educated and did not care about the physical properties of the meat, as can be seen from the low level of importance of meat colour indicated in Figure 2. These consumers tended to be from the older generation and had lower education levels.

4. Conclusion and recommendations

The study showed that a smaller percentage of consumers preferred yellow fat (13.59%) than white fat (43.74%). A lack of knowledge on the origin and properties of yellow fat, and that consumers became

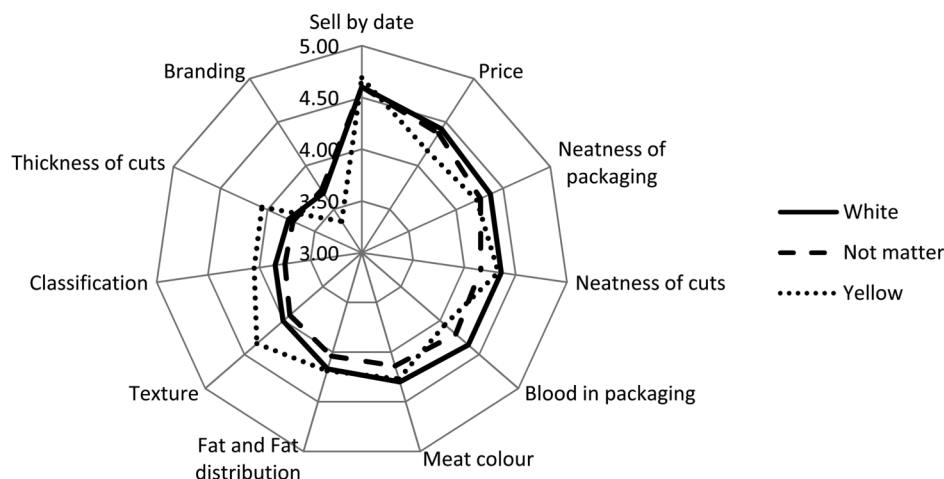


Figure 1: Importance of criteria influencing consumers' decisions when purchasing meat

Table 4: Aspects of beef that influenced consumers most negatively

Aspect		Consumers who prefer white fat (N=174)					
		Price	Grade	Fat content	Fat colour	Meat colour	Bone content
6 Biggest Influence	Head	68	23	33	12	29	14
	%	39.1	13.2	19.0	6.9	16.7	8.0
5	Head	19	40	37	27	36	15
	%	10.9	23.0	21.3	15.5	20.7	8.6
4	Head	15	23	38	36	35	27
	%	8.6	13.2	21.8	20.7	20.1	15.5
3	Head	18	27	28	41	25	33
	%	10.3	15.5	16.1	23.6	14.4	19.0
2	Head	22	31	21	31	37	30
	%	12.6	17.8	12.1	17.8	21.3	17.2
1 Smallest Influence	Head	32	29	17	27	12	54
	%	18.4	16.7	9.8	15.5	6.9	31.0

Aspect		Consumers who prefer yellow fat (N=51)					
		Price	Grade	Fat content	Fat colour	Meat colour	Bone content
6 Biggest Influence	Head	13	13	7	1	10	7
	%	25.5	25.5	13.7	2.0	19.6	13.7
5	Head	11	8	14	6	7	4
	%	21.6	15.7	27.5	11.8	13.7	7.8
4	Head	6	10	11	8	8	8
	%	11.8	19.6	21.6	15.7	15.7	15.7
3	Head	4	7	8	15	9	9
	%	7.8	13.7	15.7	29.4	17.6	17.6
2	Head	7	10	6	8	13	8
	%	13.7	19.6	11.8	15.7	25.5	15.7
1 Smallest Influence	Head	10	3	5	13	4	15
	%	19.6	5.9	9.8	25.5	7.8	29.4

Aspect		Consumers to whom fat colour does not matter (N=143)					
		Price	Grade	Fat content	Fat colour	Meat colour	Bone content
6 Biggest Influence	Head	59	26	26	5	20	8
	%	41.3	18.2	18.2	3.5	14.0	5.6
5	Head	21	34	26	13	25	24
	%	14.7	23.8	18.2	9.1	17.5	16.8
4	Head	15	27	40	24	21	17
	%	10.5	18.9	28.0	16.8	14.7	11.9
3	Head	11	19	28	41	22	23
	%	7.7	13.3	19.6	28.7	15.4	16.1
2	Head	21	17	19	27	25	33
	%	14.7	11.9	13.3	18.9	17.5	23.1
1 Smallest Influence	Head	16	20	4	32	30	38
	%	11.2	14.0	2.8	22.4	21.0	26.6

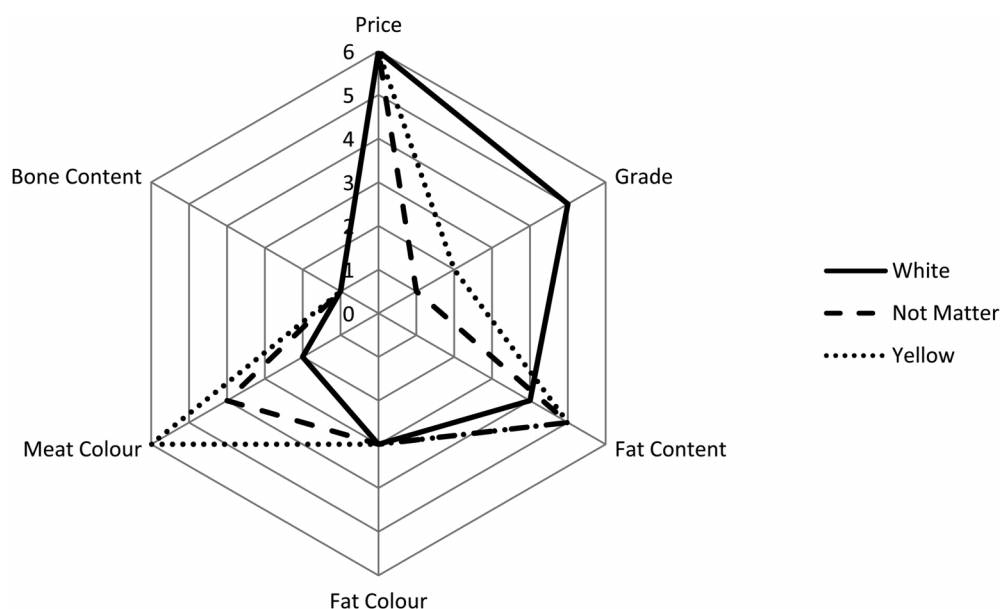


Figure 2: Aspects of beef influencing consumers the most negatively

accustomed to the white fat of feedlot-finished cattle, may have been the reasons for consumer preference of white.

For a fairly large portion of consumers in this study, fat colour did not matter (42.68%). These consumers would buy beef with white or yellow fat without considering the origin of the animal. The successful marketing of yellow-fat beef might influence this group of consumers to buy yellow-fat beef.

Grass-fed beef (all grades) make up only 25% of the South African beef supply, and is thus not enough to feed the nation, but a niche market should be developed for this product. The study showed that the consumers who preferred yellow fat had a higher level of education. These consumers were thus more likely to know the origin, properties and benefits of yellow fat and use this knowledge in their purchases. The introduction of organic produce is creating niche markets with premium prices for these products. If the relationship between organically produced beef and beef with yellow fat are marketed, beef with yellow fat may become part of a niche market. The successful marketing of yellow-fat beef as an organic product may lead to a situation where a premium is paid for yellow-fat beef.

This study only represents the preferences of consumers in the Cape Town area, and conclusions cannot be drawn for South Africa as a whole. A similar study for the rest of South Africa is recommended to determine the consumers' preferences in other regions. A thorough study of the whole country will determine if a niche market for organically produced beef, with yellow fat, will be successful and may help producers receive higher prices than what they currently experience.

About the authors

Frikkie Maré is a post-graduate student and junior lecturer in the Department of Agricultural Economics at the University of the Free State. He is involved in both postgraduate and undergraduate courses that include marketing, production economics, agricultural financing and microeconomics. Fields of research includes livestock economics, more specifically cattle and feedlots, as well as agricultural risk management.

Dr. Pieter Taljaard is a research fellow of the Department of Agricultural Economics at the University of the

Table 5: Logit regression statistics for consumers who preferred yellow or white fat

Variable	Consumers preferring yellow fat				Consumers preferring white fat			
	Beta	S.E.	t-test	Prob(t)	Beta	S.E.	t-test	Prob(t)
Persons in Household	-0.2112	0.0887	-2.3803	0.0177				
Groceries Expenditure	0.2934	0.1159	2.5304	0.0117				
Education	0.4999	0.1879	2.6606	0.0081	-0.2292	0.1419	-1.6155	0.1069
Meat Expenditure	-0.2484	0.1368	-1.8158	0.0701				0.0704
Favourite Meat Expenditure	0.2530	0.1449	1.7464	0.0815	0.1499	0.0826	1.8141	
Sell by Date	-0.4000	0.1145	-3.4937	0.0005				
Meals Away from Home	-0.2162	0.0875	-2.4696	0.0139				
Age					0.1765	0.0712	2.4774	0.0136
Income					0.1199	0.0660	1.8168	0.0700
Meat Colour					-0.2041	0.0823	-2.4795	0.0135

Free State. He is currently a full time farmer but is still involve in various research projects especially in the red meat industry.

Henry Jordaan is a lecturer in the Department of Agricultural Economics at the University of the Free State. He is involved in both postgraduate and undergraduate courses that include production economics and agricultural financing. Fields of research includes resource economics (water management) and quantitative analysis of various other projects.

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