

SHORT NON-REFEREED PAPER

CONSUMER PERCEPTIONS OF SUGAR DERIVED FROM GENETICALLY MODIFIED (GM) SUGARCANE

VERMEULEN H¹ AND GOUSE M^{1,2}

¹Bureau for Food and Agricultural Policy (BFAP), c/o L&L Agricultural Services, The Grain Building Agri-hub, 477 Witherite Street, The Willows, Pretoria

^{1,2}University of Pretoria: Department of Agricultural Economics, Extension and Rural Development, Agricultural Annex Building, University of Pretoria
c/o Lynnwood Road and Roper Street, Hatfield Campus, Pretoria
hester@bfap.co.za marnus.gouse@up.ac.za

Introduction

During October and November 2017, a consumer survey was conducted by the Bureau for Food and Agricultural Policy (BFAP). The project objective was to develop an initial impression of South African consumers' perceptions and acceptance of sugar derived from a hypothetical genetically modified (GM) sugarcane crop (termed 'sugar from GM cane') containing insect resistance and herbicide tolerance traits.

In the process of conducting an *ex ante* socio-economic study of the proposed GM cultivars, various elements had to be investigated, including farm-level impacts, sector-level economic impacts, supply-chain impacts and export market impacts. Given the critical importance of consumer acceptance when dealing with food choices the potential consumer impacts were also included. This short non-refereed paper reports on the consumer study findings.

At present only two food crops have been approved for GM commercial planting and production in South Africa – maize (insect resistant (IR) and herbicide tolerant (HT)) and soybeans (HT). Since the introduction of IR-*Bacillus thuringiensis* (Bt) maize in 1998 and HT soybeans in 2001, uptake has been significant with GM maize covering 94% of the total maize area in 2016 and GM soybeans an estimated 95% of the total soybean area (BFAP, 2018).

From a consumer perspective a comparison of results for 2015 versus 2004 from the 'Public perceptions of biotechnology in South Africa' surveys (Gastrow *et al.*, 2016) revealed rising GM food awareness and willingness to purchase. Consumers perceiving that they have eaten GM food in the past, increased from 13% to 48%. The share of South African consumers willing to purchase GM food based on health considerations increased from 59% to 77%, on cost considerations increased to 73% (from 51%) and on environmental considerations from 50% to 68%.

Materials and Methods

A total of 267 consumers spread over low, mid and high income groups (also representing typical age and racial demographics of these groups in South Africa), were surveyed during October and November 2017 through face-to-face interviews in Gauteng. The survey involved adult consumers from both gender groups responsible for food purchasing and preparation in households who typically consumed sugar. Gauteng, the 'economic hub of the nation' was targeted as the research area, as it accounts for approximately 40% of SA's household-level consumption (Statistics South Africa (Stats SA) LCS 2014/2015 (Stats SA, 2017)). The survey questionnaire (refined after field testing) utilised a wide range of question types (e.g dichotomous choice, multiple choice, Likert scale/level of agreement, rating scale

questions and open-ended questions) to gain insight into socio-economic and demographic aspects, typical sugar consumption behaviour, past exposure to GM food-related aspects, perceptions pertaining to the current presence of GM crops and food in South Africa, willingness to purchase sugar from GM cane given exposure to particular information sets, perceptions regarding GM food-related aspects (e.g. potential benefits, potential concerns, regulation of GM food) and preferred information sources to obtain more information on sugar from GM cane versus conventional sugar.

Data capturing and cleaning was done in Microsoft Office Excel, after which a wide range of descriptive, comparative analyses such as ANOVA (Analysis of Variance) and Chi-square analyses, and multivariate techniques were applied to analyse the data with SPSS (Statistical Package for the Social Sciences) version 24.0. The results obtained in this study were compared with results obtained in the 2015 'Public perceptions of biotechnology in South Africa' (PUB) survey (Gastrow *et al.*, 2016).

Results and Discussion

GM food exposure, knowledge and perceptions

Most consumers have been exposed to the concept of GM food within the last decade, through sources such as school, media (television and radio), social media, the Internet, 'word of mouth' and, interestingly, in the case of low-income consumers: exposure through agricultural activities at work. Similar to PUB 2015 the most familiar GM food-related terms were 'DNA' and 'genes'. Levels of exposure and perceived levels of understanding of the various GM food-related terms increased significantly with rising socio-economic status. Very few consumers could explain the terms 'in a lot of detail'. In the PUB 2015 study, 53% of respondents were familiar with the term 'biotechnology' compared with approximately 25% in this sugar from GM cane survey, with generally lower awareness levels in the current survey than observed in the PUB 2015 survey.

The share of consumers perceiving that GM crops were grown in South Africa increased significantly within rising income levels applying to 38.2, 40.4 and 50.6% of low, middle and high income consumers respectively [Chi-square=11.104, df=4, p=0.025] (compared with 54% in the PUB 2015 survey perceiving that the production of certain GM crops was allowed in South Africa). Among the total sample 57.5% perceived that GM food is sold in SA and 65.7% that they think that they have eaten GM food in the past (with no statistically significant differences between socio-economic sub-groups). Interestingly, a lower share of consumers in PUB 2015 (48%) indicated previous consumption of GM food. Considering consumers' expressed willingness to purchase GM food 37.1%, of the total sample was willing to 'definitely buy' GM food, followed by 34.8% indicating a more uncertain positive response ('yes maybe'). Thus, 71.9% of the total sample indicated some willingness to purchase GM food. The low-income consumers revealed the highest willingness to 'definitely' purchase GM food (49.4%) compared to about 30% for the other two groups.

In the current survey consumers' strongest negative perceptions regarding GM food related to quality concerns (lower than the quality of conventional food), naturalness and a feeling that GM food was 'wrong'. Among low-income consumers religious concerns and potential allergies were also prominent. Considering a wide range of potential benefits derived from GM crops, consumers were most positive about GM food if it improved food security in SA, made food more affordable and benefitted the environment (e.g. use less agrochemicals). According to PUB 2015, consumers were most positive about GM food if it delivered a healthier food product, improved affordability and presented environmental benefits – thus overlapping with the current survey's results in terms of affordability and the environment, but having a stronger healthy food focus than evident from the more recent survey results.

Consumers' attention to food labels were relatively high, with 27% of the total sample reading food labels often and 44.6% reading food labels occasionally in this survey. Middle-income consumers paid the most attention to food labels (30.3% reading food labels often and 51.7% reading food labels occasionally). Among low and high income consumers 27% and 23.6% respectively read food labels often, while 36% and 46.1% read food labels occasionally. Across the socio-economic spectrum respondents felt strongly that the mandatory and compulsory by-law labelling of GM food in South Africa was very important (88.0% of the total sample). Among the sub-segment of the total sample who indicated a strong willingness to purchase sugar from GM cane (n=121), 32.3% had a tendency to read food labels often, 37.2% to read food labels occasionally and 29.8% never read food labels.

In addition to food labels the most highly used and trusted information sources to potentially obtain information about sugar from GM cane were television, radio and newspapers, with middle and high income groups also preferring social media sources. However, the specific channels (e.g. which radio stations) and complexity of message content could differ when targeting different socio-economic groupings with marketing messages.

Sugar purchasing considerations

When purchasing sugar the dominant factors considered by consumers from all three socio-economic sub-groups were food safety, taste, price, appearance and quality. Food safety and price were significantly more important to low and middle income groups [(F=4.635, df=2, p=0.011) and (F=2.559, df=2, p=0.079) respectively]. Exposure to less reputable retail sources and more severe budget constraints could have contributed to these observations among low- and middle-income consumers.

Willingness to purchase sugar from GM cane

Prior to receiving any information on the nature of sugar from GM cane a significantly larger share of low-income consumers (62.9%) were willing to buy this sugar (versus 33.7% and 39.3% of middle and high income consumers) [Chi-square=22.477, df=6, p=0.001]. After presenting respondents with more information regarding sugar from GM cane (potentially being more environmentally friendly and the concept of not eating GM plant material but only a chemical compound derived from the GM plant) the low income consumers revealed a lower willingness to purchase (58.4% and 55.1% for the two information scenarios respectively). The middle and high income consumers revealed an increasing willingness to purchase following information exposure. In general the environmental argument seemed slightly more effective in making some consumers more positive about sugar from GM cane than the sucrose (sucrose is sucrose) argument. However, approximately 77% of the total sample did not change their willingness to purchase sugar from GM cane after receiving the additional information on potential environmental benefits or argument pertaining to eating sucrose and not the GM plant, whereas only ±12% of the total sample revealed an increased willingness to purchase this sugar. A significant 82.4% of the total sample indicated a general willingness to purchase sugar from GM cane if it helped the South African sugarcane industry to have a sustainable future and provide jobs.

On average the low income sample was willing to pay a 2.5% premium for sugar from GM cane, but the middle income and affluent samples preferred a discount to accept this sugar (3.9% and 0.2% respectively).

Conclusions and Marketing Recommendations:

Linking market segments to socio-economic groups

Even though a larger share of low-income consumers revealed a willingness to purchase sugar from GM cane, all three the socio-economic sub-groups contained individuals feeling positive, negative and uncertain about this sugar. Thus, market segmentation purely on socio-economic level is not recommended in this case.

Key marketing messages

Consumer education through appropriate marketing messages could be valuable, as evident from the results, illustrating that providing consumers with more information pertaining to the benefits associated with sugar from GM cane did yield a slight improvement in consumer acceptability (particularly among middle and high income consumers). These marketing messages should aim to convince consumers of the quality of this sugar (similar to conventional sugar), of the environmental benefit (due to lower pesticide application quantities) and also of the potential benefit to give the South African sugarcane industry a more sustainable future and preserve job opportunities in the industry. For low-income consumers more information was associated with a reduction in product acceptance, indicating caution when presenting these consumers with marketing messages.

The proper labelling of GM food products (backed by official legislation) was a 'non-negotiable' to all consumers in the survey. Even though approximately 70% of the total sample paid some level of attention to food labels, about two thirds of these consumers only read food labels occasionally. An interesting question is whether awareness of sugar from GM cane or concerns regarding this sugar would prompt these consumers to pay more attention to sugar labels.

Product pricing recommendations

Consumers had positive perceptions regarding the potential role of GM food to improve food affordability and also indicated a general preference to buy sugar from GM cane at a lower price than conventional sugar. Thus, a product pricing strategy at levels slightly below the 'regular' price of sugar would be optimal.

Acknowledgements

Project funding was provided by the South African Government's Technology Innovation Agency (TIA) via Biosafety SA.

REFERENCES

- BFAP (2018). Overview of GM maize in South Africa – 2016/17 production season. Study commissioned by the Maize Trust.
- Gastrow M, Roberts B, Reddy V and Ismail S (2016). *Public perceptions of biotechnology in South Africa*. Conducted for the Public Understanding of the Biotechnology Programme of the South African Agency for Science and Technology Advancement, by the Education and Skills Development Research Programme of the Human Sciences Research Council.
- StatsSA (2017). Living Conditions of Households in South Africa: An analysis of household expenditure and income data using the LCS 2014/2015. Statistical release P0310.