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Consumer Interest, Attitude and Behavior toward a Sustainable Tomato*

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Abstract

The steady increase in the consumption of fresh and processed tomatoes is threatening environmental sustainability, as water and fertilizers, two crucial production inputs, are becoming less accessible. To this purpose, the research project TomRes funded by the European Commission H2020 research and innovation programme, is currently undergoing to develop an environmentally sustainable fresh tomato. It is thus of paramount importance to understand if final consumers are willing to accept such a potential sustainable tomato and, may be more importantly, if consumers' interests and positive attitude towards this product will lead to the decision to purchase.

Hence, in this study, we exploit a sample of Italian consumers who responded to a web-survey to analyze the existence of the interest-attitude-behavior gap as well as its main determinants.

Our results confirm the existence of this gap in line with other sustainable consumption products.

Keywords: Tomato; sustainability; gap attitude-consumer behavior.

1. Introduction

Tomato is one of the most cultivated vegetables all over the world, and its production has been steadily increasing over the last decades (+91% from 1996 and 2016, FAO). This popularity is not costless, as tomato production is highly water and fertilizer intensive and both production factors are becoming less and less accessible. According to climate change forecast, rainfalls are expected to decrease by 40% in Southern European countries, and a severe water scarcity is looming (European Environment Agency). As for fertilizers, the cost of nitrogen and phosphorus has more than doubled in the last 15 years, and their use may threaten farmers' economic viability.

Under this scenario, scientific research is moving towards selecting a more sustainable tomato using both genetic and agronomic techniques. In particular, an H2020 project (TomRes - A Novel and

Integrated Approach to Increase Multiple and Combined Stress Tolerance in Plants Using Tomato as a Model) is currently underway to identify a tomato variety (non-GMO) that confers superior water and nutrient use efficiency. In this contest it is worth investigating the consumer side to understand how could consumers react to a more environmentally sustainable tomato.

The paper is organized as follows: Section 2 focuses on the literature that deals with these issues, Section 3 discusses the materials and methods, Section 4 reports the results and Section 5 draws the main conclusions.

2. The literature review

It is well established in the scientific literature that the market for sustainable food products, despite a positive trend, is still relatively underdeveloped (see, among others, Vermeir et al, 2016, and Yamoah et al, 2019). This paradox is due to the fact that the intention to buy may not always lead to the decision to purchase. This divergence, also known as the attitude-behaviour gap, has been analysed in the context of ethical consumption (see Shaw et al., 2016, and Bray et al., 2011), sustainable purchase behaviour (Jacobs et al., 2018; Terlau and Hirsch, 2015; Alphonse et al., 2014; Fraj and Martinez, 2007) and of organic food (Schäufele and Hamm, 2018). These works investigate why and how this gap exists, explaining the technical and cognitive factors that impede consumption of one good despite consumers' positive attitude.

The final, purchasing decision may be in fact inhibited by several factors. Yamoah et al. (2019) report that these factors may related to product availability, to specific characteristics of the product (in terms of price, quality, and taste), and last but not least to previous consumption habits (such as past purchases). Using individual retail data, Yamoah et al. (2019) are the first to investigate the joint effect of several inhibitors on the consumption of sustainable apples. In their analysis, the focus is on past purchase, price, product availability, and product variety. Their analysis is applied to a real, existing, sustainable product. Still, the same methodological framework can be also extended to test for the existence of an attitude-behaviour gap in the context of not yet existing products. This is the approach followed by Mancuso et al (2016), who assess which factors may accrue the gap in the purchasing process of farmed fish fed on insect meals.

The literature on tomato consumption analyse which are the most relevant factors. Meyerding et al. (2019) perform a choice-experiment on German consumers to compare the consumption drivers of fresh tomatoes vs. ketchup. In a similar vein, Maples et al. (2016) compare the characteristics of a standard tomato with those of an environmentally sustainable tomato. The two studies show that local production and the environmental footprint are the most relevant attributes for tomato consumption. Hence, our study also contributes to this line of research.

3. Materials and methods

We used a sample of 930 respondents in Italy. Data were collected through web-surveys. The questionnaire consisted of five sections: tomato-purchasing habits (*PH*), drivers of tomato consumption (*DC*), knowledge of sustainability issues (*K*), negative attitude towards TomRes tomato (*NA*), and socio and economic characteristics (*SE*).

To measure the gap we consider the three, following ordinal regressions:

$$I=f(PH, DC, K, A, NA, CB, SE)$$

$$A=f(PH, DC, K, I, NA, CB, SE)$$

$$CB=f(PH, DC, K, I, A, NA, SE).$$

The dependent variable for consumer interest I is measured by the desire of consumers to have more information. In fact, consumers must agree with the following statement: "I would like to have more information on this sustainable tomato", which is measured on a Likert scale ranging from 1, which expresses a total disagreement, to 5, which represents a full agreement. Consumer attitude A is captured by the following statement: "By consuming TomRes tomato I am mitigating the desertification problem", which is also measured on a Likert scale ranging from 1 to 5. As for consumer behavior CB , we use consumers' willingness to pay for a sustainable tomato. This variable is measured on a Likert scale ranging from 1 to 4, where 4 represents a willingness to pay up to 30% more per kg.

4. Results and conclusion

The sample of 930 respondents is characterised by the following socio and economic characteristics. Females are slightly over represented, as they account for 57% of the sample. As for age, approximately half of respondents are aged 50 or older. Generally speaking, 55% of respondents are satisfied with their income level, whereas 7% of them report adverse economic conditions. Most of the sample lives in households with 3 to 5 members, and 68% of respondents are also responsible for the household expenditure. In the sample, highly educated respondents (degree, Master, Ph.D) are over-represented (59%). This issue is typical of web-surveys, as stated by Granello and Wheaton (2004).

As for the interest towards TomRes tomato, 51% of consumers totally agrees with the idea of obtaining more information, whereas only 2% of consumers seems to be totally uninterested in the topic. A strong positive attitude towards TomRes tomato is observed in 44% of respondents, although only 12% of consumers is willing to pay a consistent price premium (up to 30%) for TomRes tomato.

Table 1 summarizes the results obtained in each of the three ordinal regressions, reporting for each variable the regression coefficient and the statistical significance.

Results show that there are some differences in consumers' involvement during the production process. In fact, on average, the sets of independent variables used in the three regressions have a different impact on interest, attitude, and behaviour. As for purchasing habits, we observe different patterns for the purchasing site and for the type of tomato purchased. Interestingly, those who consume tomato for its taste and for tradition are more interested in sustainability but less willing to spend more for TomRes tomato. The importance of the purchasing site only matters for consumer interests, and has no effects on attitude and behaviour. Among the possible reasons for a negative attitude, concerns in term of safety has a negative impact on attitude only; the concern of a lower perishability positively impacts only consumer behaviour. Generally speaking, socio-economic aspects (education, being responsible for household expenditure, and family size) are positive and significant in the interest regression. A positive attitude is more likely to be observed in women, although other variables have no impact on attitude. Age and income are significant factors only for consumers' behaviour: in particular, younger and wealthier respondents are more willing to pay more. Two variables have the same impact on all the three levels of involvement: the more they value the importance of a specific label and the more they are aware about the problem of desertification, the more they will be interested, will have a positive attitude, and will be willing to pay.

These patterns towards the consumption of a sustainable tomato are in line with those of other ethical and sustainable products: consumers are often interested but not always inclined to pay a price premium for sustainability. Policies should improve communication and should increase consumers' environmental awareness to reduce this gap in the future.

Table 1 – regression results

	I (more information)		A (mitigate desertification)		CB (WTP)	
	Coefficient	Sign.	Coefficient	Sign.	Coefficient	Sign.
α_1	0.707	0.424	-2.785	0.001	-1.900	0.007
α_2	1.524	0.079	-1.779	0.032	-0.056	0.935
α_3	2.466	0.004	-0.567	0.490	1.313	0.059
α_4	4.317	0.000	1.009	0.219		
Purchasing habits (PH)						
Fresh tomato frequency	0.119	0.172	-0.121	0.189	-0.014	0.854
[Purchasing site = farmers, farmers' market]	-0.056	0.717	-0.133	0.369	-0.057	0.642
[Purchasing site = grocery]	-0.033	0.809	-0.246	0.054	0.042	0.696
[Purchasing site = market]	0.142	0.381	-0.166	0.270	-0.291	0.020
[Purchasing site = supermarket]	0 ^a	n.a.	0 ^a	n.a.	0 ^a	n.a.
[Type = unpacked]	-0.129	0.260	-0.121	0.260	0.117	0.195
[Type = packed]	0.299	0.079	0.000	0.999	-0.027	0.832
[Type = both]	0 ^a	n.a.	0 ^a	n.a.	0 ^a	n.a.
Drivers of consumption (DC)						
Reasons for consuming fresh tomatoes: taste	0.118	0.079	0.001	0.982	-0.112	0.049
Reasons for consuming fresh tomatoes: health	0.111	0.058	0.086	0.120	0.099	0.036
Reasons for consuming fresh tomatoes: versatility	-0.022	0.683	0.062	0.221	0.008	0.851
Reasons for consuming fresh tomatoes: tradition	0.144	0.005	0.045	0.353	-0.103	0.011
Importance of price (fresh tomatoes)	-0.030	0.666	0.099	0.137	-0.321	0.000
Importance of origin (fresh tomatoes)	0.068	0.373	-0.165	0.030	-0.144	0.023
Importance of seasonality (fresh tomatoes)	-0.053	0.500	-0.010	0.891	0.100	0.112
Importance of certifications (fresh tomatoes)	0.130	0.038	0.180	0.002	0.153	0.002
Importance of sensority aspects (fresh tomatoes)	0.037	0.646	-0.100	0.215	-0.022	0.737
Importance of purchasing site (fresh tomatoes)	0.107	0.078	0.077	0.182	-0.026	0.596
Knowledge (K)						
Awareness of desertification	0.172	0.032	0.264	0.000	0.120	0.061
Awareness of environmental impact of tomato cultivation	-0.110	0.309	-0.117	0.251	-0.106	0.209
Awareness of main issues in tomato cultivation	-0.039	0.391	0.019	0.653	-0.061	0.083
Interest (I)						
Interest: more information	n.a.	n.a.	0.308	0.000	0.071	0.134
Attitude (A)						
Positive attitude: mitigate desertification	0.235	0.000	n.a.	n.a.	0.228	0.000
Negative Attitude (NA)						
Negative attitude: taste	0.057	0.313	-0.046	0.390	-0.001	0.989
Negative attitude: less natural	0.036	0.536	-0.026	0.640	-0.073	0.107
Negative attitude: safety	-0.030	0.600	-0.205	0.000	-0.030	0.499
Negative attitude: price	-0.001	0.984	0.008	0.861	-0.020	0.614
Negative attitude: perishability	-0.049	0.292	-0.080	0.071	0.082	0.024
Negative attitude: nutrition	-0.038	0.500	0.063	0.238	-0.143	0.001
Consumer Behaviour (CB)						
Willingness to pay (fresh tomato)	0.140	0.031	0.318	0.000	n.a.	n.a.
Socio-economic (SE)						
Age	0.021	0.566	0.007	0.844	-0.087	0.003
Education	0.144	0.086	-0.122	0.133	0.094	0.163
Responsible for household expenditure	0.215	0.011	-0.032	0.693	0.022	0.752
Income	-0.060	0.313	-0.034	0.547	0.194	0.000
Family size	0.143	0.055	-0.097	0.171	-0.028	0.631
BMI	-0.020	0.133	0.002	0.892	0.004	0.708
[Gender = Female]	0.046	0.673	0.285	0.005	0.071	0.411
[Gender = Male]	0 ^a	n.a.	0 ^a	n.a.	0 ^a	n.a.

a: parameters set to zero because they are redundant.

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