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# **Impact of food processing of organic products on perceived value and behavioural intentions of consumers**

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## **Abstract:**

The demand for natural, healthy products and, at the same time, for processed organic products has increased in the last decade. This transformation raises questions, both among researchers and consumers, who tend to be sceptical about processing methods. In this paper, we investigate the role of more or less innovative processes, and more or less known to the general public, on consumers' perceptions and attitudes towards organic products. To this end, we are carrying out an experiment, the fieldwork for which is currently being collected, which will make it possible to improve knowledge on the subject and to propose recommendations to professionals in the organic processing industry.

*Keywords : industrial processing, naturalness, risks, benefits, perceived value*

## 1. Introduction of paper

Although it will slow down in 2022, the consumption of organically produced food (organic products) has increased strongly in recent years in most countries of the world. In this context, the consumption of processed organic products is growing and shows the strongest growth. In France, for example, sales of organic products jumped by 19% for savoury products and by 16% for sweet products in 2020 (Agence Bio, 2021), while all organic products increased on average by 12.2% in value. At the same time, the number of processors has increased by 12%. Although the legislation (Regulation (EC) No 889/2008) imposes clear rules on the composition of organic food, most processing methods are authorised (only ionising treatments are prohibited) and meet minimalist criteria. The transposition of the principle of naturalness, a cornerstone of organic farming since the creation of the first public specification in the 1980s, to processing has not been easy in the current regulation. Food science studies have been conducted on the subject for several years (Schleenbecker et al., 2013; Kahl et al., 2014), but stakeholders are aware of a significant lack of research on consumer perception of processes in this sector. It is now essential that legislation evolves to take account of consumer opinion and focus on new industrial processing.

This context is also part of a growing demand for processed products, while looking for healthier and more natural products. In their minds, consumers often perceive organic products as more natural (Rozin, 2005; Meyer-Höfer et al., 2015) and less processed (Kahl et al., 2014). They thus conjure up beliefs and imaginaries specific to their vision. As for organic consumers, they tend to prefer traditional and natural processing (Hemmerling et al., 2016). Conversely, a product described as natural may be judged as organic and minimally processed by consumers (Berry et al., 2017). In addition, processing is not equal and leads to different perceptions (Rozin, 2006; Evans et al., 2010; Abouad and Gomez, 2015). Sometimes, these perceptions can even differ for the same process: Bearth and Siegrist (2019) showed that a product treated by irradiation was perceived as less qualitative than by ionisation (which nevertheless defines the same process). This raises questions about how consumers should approach these processing technologies.

However, what does "processed" mean, or "minimally processed"? Is it related to the composition only, or can it also be summoned through a high-tech process? We now know that consumers want to know the risks and benefits of these processes (Hüppe and Zander), so it is not enough to let them judge only the semantics of the terms related to the processing. Although processed products are attracting attention from researchers, previous research has not directly

investigated the potential effect of alternative food processing technologies on consumers' behavioural intentions, including purchase intention and willingness to pay. This is also true for organic products. This is why this research try to explore through a synthetic literature review and a field experiment that is still in progress.

## **2. Literature review and conceptual framework**

Research conducted over the last few decades has contributed to the emergence of new alternative processing methods in order to better meet consumer demands for quality and safety. Indeed, the processes and techniques associated with processing are innovating in order to offer a variety of products with improved health, nutritional and organoleptic qualities, as well as improved preservation conditions (Pardo and Zufia, 2012). Food processing, and in particular so-called 'green' processing, could be a real opportunity for manufacturers to respond to the environmental, competitive and health challenges facing our societies (Chemat et al., 2017). All the work carried out by food scientists is clear: these processes can meet a growing demand for high-quality products and would be “bio-compatible”, in other words, they would provide benefits compatible with the biological quality of food.

Consumer acceptance of food processing technologies depends on several factors. These include the perceived benefits of the technology in question (Siegrist, 2008), but also taste (Bruhn, 2007) and the quality of the final products (De barcellos et al., 2010). On the other hand, studies show that perceived risk is also a factor in acceptance (Cardello et al., 2007; Olsen et al., 2010; Albertsen et al., 2020), and that it is sometimes perceived as more important for organic products (Hemmerling et al., 2016). It is essentially the balance between perceived benefits and risks that will influence consumers' acceptance of a technology (Frewer et al., 2011; Bearth and Siegrist 2016). This raises the question of the information provided to consumers and the importance of describing these transformation processes for consumer perception (Beyer and Ortiz, 2021; Hüppe and Zander, 2021).

Naturalness is a reference and another central element in our research. For many consumers, it can be one of the most important factors in the perceptions of innovative food products (Connor and Siegrist, 2010; Albertsen et al., 2020). Some technologies can sometimes be perceived as more natural because of the benefits they offer (Sonne et al., 2012). Studies on perceptions of food processing have consistently incorporated this notion. In particular, it has been shown that processing reduces the perceived naturalness of products (Evans, de Challemaison and Cox, 2010; Rozin, Fischler and Shields-Argelès, 2012). In fact, consumers may be wary of processing because of a negative impact on perceptions of naturalness, but also

of nutritional quality and healthiness (Roman, Sánchez-Siles and Siegrist, 2017; Sanchez-Siles et al., 2019; Bote-lo et al., 2019; Szymkowiak et al., 2020). When looking at the link between processes and naturalness, the nature of the process itself therefore has an impact on the perception of naturalness and the behavioural intentions of consumers. Manufacturing with a manual process will increase the perceived naturalness of the product (Abouad and Gomez, 2015; Frizzo et al., 2020) and this has an impact on purchase intentions and willingness to pay (Frizzo et al., 2020). Etale and Siegrist (2021) show that processes perceived as traditional lead to a better perception of the naturalness of products.

A study by Grant et al. (2021) sought to evaluate the preferences of American consumers of a macaroni and cheese dish (long shelf life) according to three attributes: the list of ingredients (clean label), the preservation process used, and the price. The results show that respondents value microwave sterilised macaroni and cheese more than conventional sterilised macaroni and cheese, and a clean label ingredient list more than a longer ingredient list with different additives. Furthermore, they show that innovative technologies can substitute for additives. This result goes against a number of studies on the subject, which we explain in part by the importance attached to the composition of food. When this attribute is neutralised, innovative technologies are much less valued in the context of organic products. For example, Asioli et al. (2019) showed in Romanian consumers that traditional air-drying is preferred to microwave drying for organic foods.

Our French conceptual framework is presented in Figure 1 and proposes to test relationships that have never been demonstrated before. Indeed, to our knowledge, there are no studies that validate the effect of industrial processing from a technical point of view on the perceived value of a product by consumers. Given our intellectual path, we propose to test these new relationships. Many research validate the significant effect of perceived value on purchase intention (Grewal et al., 1998), and especially in the context of organic products (Lee and Hwang, 2016; Konuk, 2018; De Morais et al., 2020), we will also test this hypothesis.

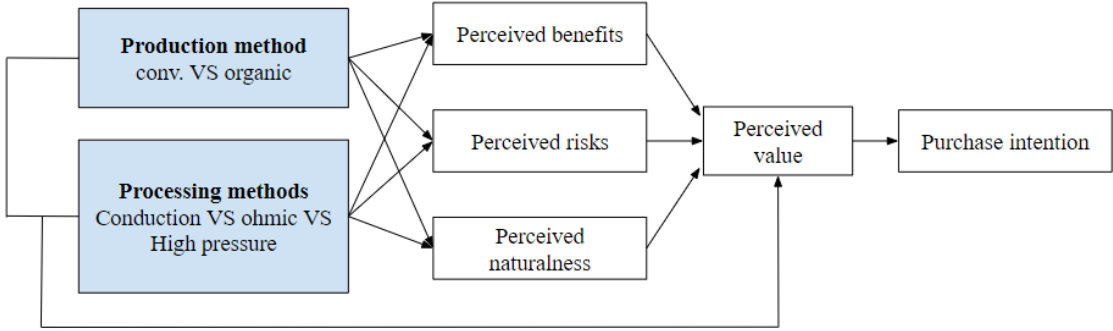


Figure 1. Experimentation model

### **3. Methods**

An experimental approach was chosen to answer our research problem and to highlight causal relationships (Evrard et al., 2009). We worked with experts in food science and partners of the RMT Actia TransfoBio and the ITAB to define the product and its characteristics within a realistic framework. The product on which we will conduct our experiment is apple puree, a common product that has the capacity to undergo different alternative processes during the preservation stage.

#### *3.1 Design*

This experimentation led us to carry out a full factorial design with two independent variables, which allows us to make them interact (Malhotra et al., 2017) and to check the influence of their interaction (Evrard et al., 2009). This 6-cell factorial design: 2 (production mode: conventional VS organic)  $\times$  3 (transformation processes: conduction VS ohmic VS high pressure) is conceptualised in Table 1. This number of experimental cells seems reasonable to us and therefore does not require the use of a fractional design to meet our objectives.

#### *3.2. Procedure and measures*

We aim at a representative sample of the French population of 270 respondents on the basis of gender, age and their professional situations. Six fictitious products were designed, based on an apple puree, each with its own processing and production method. Six questionnaires were written in LimeSurvey with a pre-presentation of these six different apple purees. For each, it was indicated that the respondent was shopping and that the purchase of an apple puree was noted on their list. An explanation of the processing methods is given to the respondents, e.g. the principle, the impact on the nutritional characteristics, the age of the process, or the storage conditions involved. Questions allow us to measure our concepts of perceived value, perceived risk, perceived benefits, and finally purchase intention based on relevant literature and semi-structured interviews conducted prior to this stage of the thesis project. These concepts were then measured using a 5-point Likert scale ("strongly disagree" to "strongly agree"). Perceived benefits were measured using 5 items (adapted from Brunner et al., 2018, and perceived risk using 5 items. Perceived value was measured with 15 items under four dimensions: social, economic, emotional and quality (adapted from Sweeney and Soutar, 2001) . Respondents were asked to indicate their purchase intention using a 3-item semantic scale (I intend to buy this product, I want to buy this product, I plan to buy this product). Willingness to pay was measured using a quantitative variable: respondents were asked to indicate an amount in euros that they would be willing to pay for the product in question. To

measure perceived naturalness, we asked participants to indicate the degree of naturalness on a scale from 0 (not at all natural) to 100 (extremely natural) using a slider. This question was also asked for the undergone process only. In order to limit the impact of potential external variables (brand, packaging, etc.), we chose to present our scenarios without visuals and by means of an online experiment. In order to better characterise the profiles of the consumers who will be interviewed, a certain number of attributes will be collected, again using 5-point Likert scales. We find: (i) consumption habits (apple puree, organic products, and processed products), (ii) attitude towards health (2 items adapted from Roininen et al., 1999), (iii) attitude towards naturalness (Michel and Siegrist, 2019), (iv) lifestyle, and (v) neophobia towards food technologies using the FTNS scale (Cox and Evans, 2008). Finally, we measure some socio-economic, demographic and other variables.

### *3.3. Pre-tests*

We conducted a pre-test of our questionnaire with about ten people to identify possible comprehension problems and to assess the response time. Although the final administration will take place online, this stage was conducted face-to-face in order to observe the respondents' reactions and attitudes (Malhotra et al., 2017). They were asked to think aloud as they responded, and a debriefing took place. Modifications and adjustments were made and we conducted a second pre-test with ten individuals online only, who were asked to give us written feedback on what they found problematic. Minor adjustments enabled us to propose a final version of the questionnaire. Finally, a third pre-test with about thirty individuals was carried out and on which we are carrying out a data analysis. This stage is currently underway.

## **4. Provisional results**

The initial results on the small sample tested make it possible to validate our measurement scales, and in particular those that have not been tested on a French scale. They also allow us to validate certain hypotheses that we had developed in our conceptual framework. The use of a survey institute (PanelLabs) is planned for 2022 for our final data collection. Structural equation modelling is envisaged using a PLS approach. This data collection, followed by a data analysis and a restitution of the results could be presented during the conference that will take place on 13 and 14 October of this year and will allow us to formulate relevant recommendations to the professionals of processed organic products.

## 5. Conclusion

The effect of industrial processing on consumer attitudes has been the subject of much interest among food scientists in recent years (Hüppe and Zander, 2021). In this ongoing research, we aim to show that food processing technologies may or may not have an impact on whether a product is organic or not and how this influences the perceptions and attitudes of French consumers. Our results may also have important managerial implications. Certain processing methods, considered by experts to be more environmentally friendly and gentler, may be more or less well perceived and impact on purchasing intentions.

We would like to point out that this research offers many other possibilities and avenues for future research. We considered three different technologies that can be used in the preservation stage of a simple product in the eyes of consumers. This choice was made in view of the technical constraints, the industrial reality of these alternatives, and the possibility of applying them to other products for comparison. A replication of this study with a more 'complex' product and with a higher degree of perceived transformation - conjuring up other imaginary images in consumers - could allow this research to be improved, especially as new products (Novel Food) are often complex products. Other product-process combinations could also be encouraged here, in particular extrusion on cereal products, which raises questions among manufacturers. In addition, product type influenced the perceived naturalness of the product (Evans et al., 2010; Chambers et al., 2018; Etale and Siegrist, 2021; Michel et al., 2021). It is therefore likely that the naturalness of a more complex product will then influence the perceived value and purchase intention of the product in question, differently from an apple puree. The size of the company and the image of proximity reflected by the processor could also give rise to further study based on the possible associations between the characteristics of the companies and the perceptions of the product through the transformation processes, through the traditional character or naturalness. In this respect, Scekcic and Krishna (2021) have shown that products made in smaller firms are perceived as more natural, whether experienced directly or seen in advertisements, and have an impact on purchase intention.

Ultimately, if the organic regulations evolve in a more binding way, and preserve the quality of organic products as imagined by consumers, this will have a positive impact on the brand equity of organic. This provides an avenue for research to better understand what might be tainting the image of organic and the adverse consequences that certain technologies might have on consumer attitudes and thus the sustainability of the market.



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