
Offre de thèse en économie comportementale appliquée aux Nouvelles Techniques Génomiques :

Behavioral economics for studying perceptions of bioengineered products

Organisme d'accueil : IFP Énergies Nouvelles (IFPEN), Rueil-Malmaison (92 852).
Pour plus de précision :
<https://www.ifpenergiesnouvelles.fr/ifpen/presentation>

Durée : 36 mois, à partir de novembre 2026.

Modalités de dépôt de candidature et contact :

Adresser CV + lettre de motivation, à l'attention de :

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Allocation de thèse IFPEN

Résumé de la thèse (descriptif complet p.3) :

Les progrès en biotechnologie ont permis l'émergence des Nouvelles Techniques Génomiques (NTG), qui ont le potentiel d'accélérer la transition agroécologique. Cependant, leurs applications impliquent des coûts et des risques importants, avec des conséquences potentiellement irréversibles. Les réactions mitigées du grand public à l'égard des produits issus de la bio-ingénierie ouvrent la voie à des analyses comportementales dépassant la simple approche coûts-avantages.

Cette thèse de doctorat vise à étudier, sous l'angle de l'économie comportementale, les perceptions du public à l'égard des produits issus des NTG. En particulier, ce projet vise à i) déterminer les facteurs les plus importants susceptibles d'influencer l'émergence d'innovations basées sur les NTG, ii) améliorer notre compréhension de la perception qu'en a le grand public, et iii) effectuer une analyse de la demande potentielle pour ces produits issus des NTG. Ces objectifs seront abordés dans trois chapitres. Le premier chapitre s'appuiera sur la méthodologie Q pour déterminer les facteurs les plus importants parmi ceux qui ont déjà été mentionnés dans la littérature. Dans le deuxième chapitre, nous évaluerons la perception du public à l'égard des produits issus des NTG en analysant l'importance relative des principaux obstacles à leur acceptabilité sociétale. À cette fin, une expérience de choix discret (DCE) sera mise en œuvre en mettant l'accent sur l'impact des différentes incertitudes. Enfin, le troisième chapitre évaluera, via la mise en place d'une expériences économiques de laboratoire, le potentiel commercial de deux catégories de produits (alimentaires et non alimentaires) issus des NTG en estimant auprès des consommateurs leurs dispositions à payer ou à accepter.

Cette thèse contribuera à l'économie comportementale en analysant trois cas d'application distincts. Chaque cas sera l'occasion de présenter des articles originaux démontrant l'expertise acquise par le(la) doctorant(e).



Autres  lments sur la th se :

Directeur de th se :

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Etablissement d'inscription en th se :

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Profil :

- Master (M2) en  conomie, en  conomie de l'environnement, de l' nergie et des transports, en  conomie comportementale ;
- Ing nieur avec une formation en  conomie.

→ Pr requis : micro conom trie (variables qualitatives, panel, mod les de choix discrets, etc.).

Descriptif du sujet de thèse :

A. Context

New Genomic Techniques (NGTs) has the potential of significantly contribute to the acceleration of the agroecological transition. Unlike traditional Genetically Modified Organisms (GMOs), which incorporate foreign genes from different organisms, NGTs are developed using systems such as CRISPR/Cas (Clustered Regularly Interspaced Short Palindromic Repeats) or cisgenesis, which selectively modify the DNA in the organism's own genome. These techniques can aid in achieving sustainable agricultural intensification, developing new products, including functional foods with enhanced nutritional qualities or other beneficial properties such as resistance to environmental stresses (drought or diseases for instance; see Ryffel, 2017; Mishra and Zhao, 2018) due to climate change. Certain plant varieties developed using NGTs are already available in some countries, including the United States of America and Canada. However, no organisms created through these techniques have yet been approved by the European Commission. The regulation is still under discussion at the European Level. According to the most recent debates about this forthcoming regulation, only products with more than 20 DNA mutations would be classified as GMOs. This new regulation would emerge in a context of reluctance by many consumers. Such resistance in Europe can be perceived in the regulatory framework, with a series of cautionary decisions reflecting a widespread climate of mistrust. These decisions do not facilitate integrating products derived from NGTs into society. As a result, controversies are emerging over the ethical, health, economic and environmental dimensions associated with the production and consumption of these future bioengineered products.

On the supply-side stakeholders (farmers, industrials, etc.), viewpoints are generally supported by scientific arguments and can therefore be discussed, corroborated, or challenged by other scientific arguments. On the demand-side stakeholders (roughly referred as the "(general) public", and/or consumers) viewpoints seem more subject to stereotyped representations of the genome-editing techniques used and, therefore, of the associated risks, imagined or real. Over time, these representations can be reinforced and transmitted. For example, the public may limit its understanding of NGTs to "new GMOs" (a term already popularized by the press), transferring thinking patterns that could lead to the outright rejection of any proposed future bioengineered product. A problem of societal acceptability like that encountered during the GMOs controversy can therefore be anticipated, with complex causes and mechanisms (Grison, 2008; Jollivet and Mounolou, 2005).

A body of literature has already attempted to account for this problem of societal acceptability. In the case of GMOs, meta-analyses (Lusk et al., 2005; Frewer et al., 2013; Hess et al., 2016) have documented that transgenic GMOs were widely negatively perceived by consumers. In Europe, there are strong concerns that biotechnologies, in general, could be harmful to humans and the environment, even though public knowledge on the subject is often limited and negatively biased (Marangon et al., 2021; Lucht, 2015). ANSES (2023) analyzes the Eurobarometer survey on 26,509 European citizens and confirm the negative perception of food genetic modification. In addition, the Greenpeace survey (Greenpeace, 2022) shows a strong demand for information from the French, who are concerned about transparency in labeling future products derived from NGTs. However, a significant criticism of the literature on the public perceptions of NGTs (and GMOs) concerns the common methodologies used to capture people's preferences (direct question surveys or semi-structured interviews). Although they are excellent for measuring opinions, they are less accurate than Stated (SP) and Revealed Preference (RP) Methods for obtaining precise estimates of in-depth mental processes. Compared to RP data, where real world choices are analyzed, SP methods produce data that can look at hypothetical choice scenarios by proposing to choose alternatives that do not exist yet. It is a strength as it is one of the few methods with laboratory experiments that allow for an ex ante evaluation of public policies that do not yet exist. It may also be a curse as respondents make fictional choices rather than real ones. These are the methods from behavioral and experimental economics that will be used in this Ph. D. project.



Objectives and methods

The principal challenge for this Ph. D. project is to unravel the complex factors influencing public perception of NGT-derived products. Addressing this issue is essential to bridge the understanding gap and to prompt biotechnology researchers to consider public concerns and expectations as they innovate. Indeed, this research project pursues **three objectives**. **First**, it aims to determine the **most important factors** that may affect the emergence of NGT-based innovations in markets. **Second**, it will evaluate the **public perception** of NGT-derived products with a focus on the impact of uncertainty on societal acceptability. **Third**, it intends to analyze the **potential demand** for these products.

To meet these objectives, the research will rely on **behavioral economics** approaches, using three complementary methodologies – **Q-Methodology**, **Discrete Choice Experiment (DCE)** and **laboratory experimentation in economics** – for addressing the different concerns and expectations on this sensitive topic. While DCE and laboratory experiments are standard in behavioral economics, Q-methodology complements these approaches by focusing on the subjective nature of decision-making. They therefore bring new perspectives to the discipline, enabling better simulation of public policy scenarios or situations that do not yet exist, and analysis of the resulting behaviors and reactions. By doing so, they are able to test public policies before they are implemented and estimate their effectiveness *ex ante*. For all these reasons, these methods are ideally suited to studying public perception of future NGT-derived products. They ensure that various dimensions of public perception are addressed, enabling the design of more effective consumer-centric innovation and public policies. The economic analysis of preferences dimension provided by the results of this thesis project will complement the other perspectives on ethical issues and future governance models.

B. Research strategy

Three complementary studies are proposed, each of which will constitute a chapter of the thesis and be publishable as a peer-reviewed journal article. The lessons learned from each study will be compared in the general conclusion of the thesis. As already explained, it is difficult, if not impossible, to rely on revealed preferences methods to carry out studies analyzing behaviors in real markets - where NGT products would be offered - as long as innovation has not been introduced or sufficiently diffused. For these kinds of products, this assessment can be made based on hypothetical experiments, such as DCEs or laboratory experimentations in economics. On the one hand, these two methods of revealing preferences allow respondents to choose between different scenarios in a highly controlled environment. This enables statistical analysis of the choices made (trade-offs) and emphasizes salient facts that we want to highlight by testing them through different treatments. On the other hand, one limitation of these methods is that they require a controlled environment with a limited number of decision variables available to respondents. However, the literature review shows that various factors may influence the emergence of NGT-based innovations in the market and how the public perceives them. Ultimately, these factors affect consumers' acceptance of these products.

In the **first chapter**, we aim to determine the key factors, among the benefits and harms of NGT-derived products that have already been mentioned in the literature, and that will be included in the DCE (Chap. 2) and the laboratory experiment (Chap. 3) developed in this thesis. Following Armatas et al. (2014), we believe that the Q-methodology will be very useful for identifying, selecting, defining, and articulating these (too many) various factors in a way that is relevant and understandable to the respondents. Q-methodology is a well-established tool for systematically exploring subjective opinions and identifying shared viewpoints or patterns of thought within a given population. It offers a structured and statistically rigorous approach to the study of human subjectivity (Barry and Proops, 1999; McKeown and Thomas, 1988). Participants complete a *Q-sort*, a rank-ordering exercise designed to reveal "insight into the values and preferences held by the public" (Steelman and Maguire, 1999, p. 362). In the study proposed here, participants will be asked to rank a series of statements about NGTs along a forced distribution (e.g., from "strongly agree" to "strongly disagree"); a.k.a.

a Q-sorting task. These statements will represent a range of implications of NGT-derived products. By requiring participants to prioritize their rankings, the Q-sort highlights both their most and least strongly held beliefs, thereby producing a structured and quantifiable map of diverse viewpoints. The Q-sorts will be analyzed thanks to factor analysis methods, such as Principal Component Analysis or Centroid Analysis, which results in a methodical rendering of numerous perspectives into a small number of general perspectives. As a result, this chapter should provide an objective, transparent, replicable, and statistically rigorous basis for selecting and defining attributes in the others two chapters. This requires a detailed understanding of respondents' experiences and points of view.

In the **second chapter**, we propose to assess the public perception of NGT-derived products by analyzing the relative importance of the main barriers to their societal acceptability. To this end, a DCE (Train, 2009) will be implemented with a focus on the impact of uncertainty. Thus, we will construct hypothetical scenarios with obstacles to acceptability already identified from the literature, such as health safety concerns, environmental impacts, or information transparency. Participants will be invited to choose the scenarios they find most acceptable compared to the others. Beghin and Gustafson (2021) already made a review of 59 studies on public attitudes and willingness-to-pay (WTP) for foods derived from NGTs. Lemarié and Marette (2022) point out this literature focuses on risk assessment for health and the environment when evaluating NGT innovations. The authors argue that NGT regulation should not be limited to scientific risk assessment alone. Policy makers may also need to include ethical and socioeconomic criteria. Such criteria could cover energy and food diversity, value distribution along the supply chain, and societal impacts. Citizens may oppose NGTs not because of direct safety risks, but because they fear broader impacts: concentration of benefits in a few hands, erosion of food diversity, or negative ecological effects. On the other side, the authors highlight another, often overlooked, dimension: the major risks facing conventional crops (crop fragility to the drought and/or to the disease) leading to very low yields or a collapse of a given crop. In this context, does a higher probability of collapse increases the social desirability of NGTs?

We will question the representations of uncertainty associated with the perception of bioengineered products, focusing on ambiguity attitudes instead of risk attitudes (Ellsberg, 1961)¹. In addition to the proposed direct measures of ambiguity attitudes, we will incorporate follow-up questions in the DCE survey designed to measure participants' attitudes toward uncertainty (Cavatorta and Schröder, 2019). This will enable understanding how individuals' tolerance for uncertainty may influence their opinions on NGTs, adding depth to our understanding of the factors shaping their perceptions of these biotechnologies. Data analysis will be performed thanks to estimators derived from specific econometric models (Discrete Choice Modelling) used to analyze stated choices such as proposed in DCE surveys.

In the **third chapter**, we aim to conduct a demand analysis for NGT-derived products. We will investigate whether there is a potential market for two product categories (food and non-food) derived from NGTs by estimating consumers' willingness-to-pay / willingness-to-accept, within hypothetical scenarios (since regulation is not yet implemented). The products chosen for the experiment will correspond to those currently under development, such as tomatoes (food) or cosmetics (non-food that is not ingested) or tires (non-food and not in direct contact with the skin). To conduct this study, a specific laboratory experimentation in economics will be administered to a representative sample of the French population. Different scenarios will be considered regarding the impact of NGT on both quality of food and the environment (for instance the reduction in pesticides use). The lab allows a great control regarding the revelation of information to participants. A set of hypothetical scenarios will be created, each featuring different levels of characteristics of the products studied. For example, one scenario might include a possible high value for an NGT product, but

¹ The definition of risk and ambiguity in economics (two components of uncertainty) differs from their standard definitions. Risk refers to a situation involving a random mechanism generating measurable probabilities assigned to positive and/or negative outcomes. When considering bioengineered products, we hypothesize that individuals will deal with "ambiguities", thus forming beliefs and/or judgment heuristics that may bias their acceptance decision in a more unpredictable way than for a simple risky situation. Ambiguity is extensively studied under the prospect theory paradigm (Tversky and Kahneman, 1974).

with greater environmental benefits (compared with a non-NGT product), while another scenario might involve a possible low value but with less certainty regarding long-term safety.

Based on elicited willingness-to-pay, we will examine a model of investment in research and development (R&D) in the food sector, taking into account new genomic techniques (NGTs) and traditional hybridization methods. The model will integrate uncertain and costly food innovation, as well as consumers' willingness to pay (WTP) for a new food (as made by Marette et al., 2023). This conceptual framework will be applied to the case of tomatoes studied in the lab. We will determine whether or not NTGs will be socially beneficial in a context of complete or incomplete information, and depending on the probability of success of an innovation based on these NTGs. The scenario of disease threat to conventional tomatoes will be also considered.

C. References

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