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Consumer perception of vegetables resulting from conventional field or greenhouse agricultural methods

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Consumer perception of vegetables resulting from conventional field or greenhouse agricultural methods¹

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Abstract

This survey studies the way in which French consumers perceive fruits and vegetables, be they local, domestic or imported, resulting from conventional field or greenhouse agricultural methods, in terms of a health and hedonic, then a sustainability, point of view. The method employed, focus groups with individual questionnaires and the use of real-to-life scenarios, allows to get findings concerning the knowledge of the various cultivation methods, attitudes concerning these various methods, the role of information, to expose three representational profiles and, the results of the producer scenario, distributor scenario and consumer scenario study. On a general level, this study brings to light the negative image associated with greenhouse growers but consumer perception varies according to the representational profiles (Traditionalists, Spendthrifts and Responsible).

Key words

Sustainability. Consumer. Food consumption. Scenarios method. Focus groups. Agricultural production methods

La perception par le consommateur des légumes issus de l'agriculture conventionnelle ou de production sous serre¹

Résumé

Cette étude s'intéresse à la façon dont les consommateurs français perçoivent les fruits et légumes, locaux, nationaux ou importés, issus de l'agriculture conventionnelle ou de production sous serre, du point de vue de la santé, des aspects hédoniques et de la durabilité. Des focus groups complétés par des questionnaires individuels et par une étude de scénarios ont permis de mettre en évidence les niveaux de connaissance et les attitudes concernant les différentes méthodes de production, le rôle de l'information, de présenter trois profils de représentation et les réponses des consommateurs face aux scénarios producteur, distributeur et consommateur. De façon générale, cette étude montre que l'image associée à la production sous serre est négative, mais les perceptions varient selon les profils de représentations (Traditionalistes, Economes, Responsables).

Mots-clés

Durabilité. Consommateur. Consommation alimentaire. Méthode des scénarios. Focus groups. Methods de production agricoles.

Codes JEL : D1; D8; M31; Q01

¹ This study is part of a French project ANR-ADD "Ecoserre" on greenhouse sustainability

1. Introduction

As the discourse on sustainable development from authorities and food industry stakeholders is more and more widespread, consumers themselves are becoming all the more critical of conventional agriculture. Responding to the need of consumers to be reassured, the growth of agricultural methods such as organic, integrated agriculture² has increased significantly in the last decade. Consumers associate these production methods with better environmental preservation, fuller-flavoured produce, and better health. However, despite all the positive connotations associated with these methods of agriculture, several studies (Schaer and Sirieix, 2000; Moreau-Rio and Sirieix, 2004) show that a certain confusion concerning these terms exists, and that few consumers actually differentiate between them. Added to that is the issue of production origin—local or imported—related both to the wage-earning conditions of the workers in the sector and the effects transportation has on the environment.

However, the percentage of the market for products resulting from organic or integrated agriculture methods remains fairly low, indicating that the mode of production is not *per se* a criterion sufficient enough to determine consumer choice. Although these methods of production may be appreciated by consumers, they correspond to a very small portion of actual purchases made, whereas the majority of vegetables sold are produced by conventional agricultural methods, including, for the best part, the sheltered or greenhouse method, which is currently a well-established, predominant mass production system.

The various observations above inspire an interest in the points of view of consumers and increasingly fuel the debate on production conditions:

How are fruits and vegetables resulting from conventional field agriculture perceived? Are consumers aware of the techniques used in conventional agriculture? Are they sceptical about conventional agriculture or do they idealize it by equating the phrase “open field” with natural products? How do they perceive the greenhouse method? Popularized in the 1950s and 60s, this intensive production method presents weaknesses because of the large-scale use of fossil fuels it entails and the waste products it rejects; however, its remarkable efficiency in terms of water use, the fact that it makes it possible to develop integrated protection of crops and fight against mineral pollution and, lastly, the significant number of jobs it creates, are undeniable assets. The status of the greenhouse method may thus be considered as contradictory from a sustainability point of view: can an agricultural production method be at once intensive and respond to the social, economic and environmental expectations of sustainable development?

This article aims at responding to these questions by studying the way in which French consumers perceive fruits and vegetables, be they local, domestic or imported, resulting from conventional field or greenhouse agricultural methods, in terms of a health and hedonic, then a sustainability, point of view.

The second section presents a review of the literature pertaining to this research and the hypotheses retained. The third section details the methods employed, focus groups, individual questionnaires and the use of scenarios. The fourth part presents the focus group findings concerning the knowledge of the various cultivation methods, attitudes concerning these various methods, the role of information, and exposes three representational profiles. The fifth part presents the results of the producer scenario, distributor scenario and consumer scenario study. The article ends with a discussion followed by a presentation of the implications, limitations and perspectives of the research performed.

² We use the term “integrated agriculture” to denote the agriculture that promotes a set of sustainable technologies, including integrated pest and crop management and the rational use of chemicals

2. Theoretical Framework and Main Hypotheses

Theoretical Framework

In order to understand the perceptions consumers have of the various production methods and of the diverse origins of fruits and vegetables, we shall refer to three different fields of the literature on consumer behaviour. The first deals with the emergence of concerns over sustainable development, and the following two with consumer preference for all things “natural” and “local.”

Consumer concerns about sustainable development:

Multiple works underline the growing importance of concerns about sustainable development and the consumer interest surrounding environmental and social criteria in product selection (Torjusen *et al.*, 2001, Vitell *et al.*, 2001, Tallontire and Blowfield, 2001). Over the last few decades, some notable evolutions in the behaviour and concerns of certain consumers have been observed. These consumers pay attention not only to the benefits that a particular product can bring them, but are also aware of the conditions of distribution and product use (storage, preparation, energy and material consumption, waste, etc.) as well as those of production, breeding, or fabrication.

Study of the literature reveals, however, the ambiguity of the relationship consumers have with these concerns over sustainable development; as a result certain researchers are lead to question the role such concerns—and even myths—play in the purchasing decisions of the consumer (Carrigan and Attalla, 2001). The divide that exists in general between attitudes and behaviour of consumers is indeed particularly important in this field (Vermeir and Verbeke, 2006). Chatzidakis, Hibbert and Smith (2007) explain this discrepancy in a qualitative study on fair trade with the aid of the neutralization theory. Neutralization allows individuals to adopt a behaviour inconsistent with the standards and attitudes they have expressed, in minimizing or even eliminating the effects that their non-conforming behaviour should have on the image that they hold of themselves. The authors observed four neutralization techniques employed by participants:

- denial of responsibility;
- denial of prejudice (or of benefits): considering that one’s action has no effect on others (this may be likened to the notion of perceived efficacy);
- condemnation of those who judge: attacking figureheads of the cause one is supposed to support, in order to defend oneself for one’s lack of action;
- another priority: another cause, more important in the eyes of the person, explains why he/she is making a trade-off.

It is therefore rather difficult to obtain results that clearly reflect the actual behaviour of consumers in this field on the basis of questionnaires. Beyond problems of measurement or choice of methodology, the difficulty of exposing the concerns of consumers or of making the connection between these concerns and their behaviour, raises the question of internal conflicts by which individuals are confronted and the resulting decisions that are made. Thus the discrepancy between the claims made during a questionnaire interview and the actual behaviour may reflect a conflict between the citizen and the consumer. In addition, depending on the situation, consumers may modify their priorities: for example, individuals preoccupied by the environment may “forget” this aspect when evaluating a product because the more interesting aspect is price.

The Idealization of “Natural”

In many respects people prefer the natural. Rozin *et al.* (2004) have demonstrated that this predilection for the natural is particularly strong where food is concerned. Even if people explain their preference for the natural by

the presumed health benefits, Rozin *et al.*'s study shows that even when the two versions (natural and artificial) of the same product are presented as equivalents, people still prefer the natural.

The authors study six beliefs that may possibly explain this preference. The first four are qualified by the authors as instrumental beliefs, according to which natural is better because 1) human intervention damages nature, 2) that which is natural is better for one's health, 3) natural products have more flavour, 4) natural is purer and thus more safe. The last two beliefs are related to the moral or aesthetic superiority of choosing natural: natural is superior because it precedes human intervention, and because it is in essence better.

This preference may be linked to the contagion principle (Rozin and Nemeroff, 1990). According to this principle, when two objects enter into contact with one another, the properties of one are transmitted to the other. A product "contaminated" by human intervention in turn runs the risk of "contaminating" the person who will consume it.

The Predilection for "Local"

The majority of the studies comparing imported, domestic and local products (Chambers *et al.*, 2007) or dealing specifically with consumer perception of local products (Roininen *et al.*, 2006) reveals a consumer preference for domestic products and an even more distinct preference for local products.

The reason most often evoked is better quality (Weatherell, 2003; Roininen *et al.*, 2006; etc.), identified in particular with freshness and taste (Weatherell, 2003). Transparency is also greatly appreciated: "*we know where the products come from*" (Roininen *et al.*, 2006). Consideration for health safety is also mentioned (Chambers, 2007).

This preference for domestic or local products leads consumers to accept paying a price that is 5 to 10% higher for these products (Weatherall, 2003; Darby, 2007). Local products are also likened to products that are more expensive (Roininen *et al.*, 2005), even reserved for an "elite" (Chambers *et al.*, 2007).

Lastly, sustainable development-related motives are at the core of more and more research, the purchase of local products being considered as an act contributing to the protection of the environment, supporting the local economy (Roininen *et al.*, 2006; Selfa & Qazi, 2005) and creating or encouraging ties with local producers (Sage, 2003). This preference for buying local may, however, result in protectionism ("defensive localism," Winter, 2003).

Research Hypotheses

Based on the review of the literature as above, we propose the following hypotheses:

Two hypotheses concern knowledge of the methods of cultivation and of their impact on the environment:

H1 Consumers are aware of and distinguish between different agricultural methods.

H2 Consumers ignore the environmental impact caused by each agricultural method.

A third hypothesis concerns attitude:

H3 Attitudes vis-à-vis the open field production method are more favourable than those vis-à-vis greenhouse agriculture (open field production is perceived as better than greenhouse production for taste, consumer health, the environment, local producers and social conditions).

The fourth hypothesis focuses on the criteria of consumer decision-making:

Concerns linked with sustainable development do not constitute an important decision-making criterion for the majority of consumers.

The fifth hypothesis is concerned with the role of information:

The introduction of information positively influences the attitude vis-à-vis the environmental aspects and social conditions of agricultural methods.

3. Research Method

Focus Group and Individual Questionnaires

The aim of this study is to characterize the perception of consumers concerning not only the health and taste, but also environmental and social aspects of products resulting from different methods of cultivation. With this objective, we organized four focus groups in 2007, each composed of 34 members, in the Montpellier area (southern France), ranging from age 20 to age 70, divided between women and men, of urban and rural origin, executives, employees and students (see Annex for composition breakdown) in order to discuss the theme of “tomato consumption,” (see *The Tomato Market Annex*).

Focus Groups are particularly well adapted to the study of complex behaviour such as consumer decision-making. The Focus Group approach allows for the exploration of a phenomenon, the attraction of consumers to certain products when no such study has yet been performed on the subject, and for the formulation/testing of certain hypotheses (Stewart and Shamdasani, 1990). Each person is encouraged to participate and explain his/her point of view to the others (Morgan and Krueger, 1993). Thus they are free to choose in what manner they wish to respond, interact, debate and change opinions during the discussion with the others, thereby adding depth to the qualitative information.

During the focus groups, participants also completed individual questionnaires concerning knowledge of production methods, their attitudes and beliefs towards these methods and product buying criteria.

The Scenario Method

In complement to the discussions, the Scenario Method was used in order to evaluate the perception of production methods in relation to the image that the consumer has of the producer and distributor.

The aim of the Scenario Method is to study the perception of consumers by asking them to envisage themselves in the different roles: as the producer, then as the distributor, and finally as the consumer. For each scenario proposed they have to determine the various possible decisions that can be made by these three actors, evaluate the probability of each decision being made, and estimate to what extent the decision would best suit the “average consumer.”

The following chart outlines the steps of the Scenario Method.

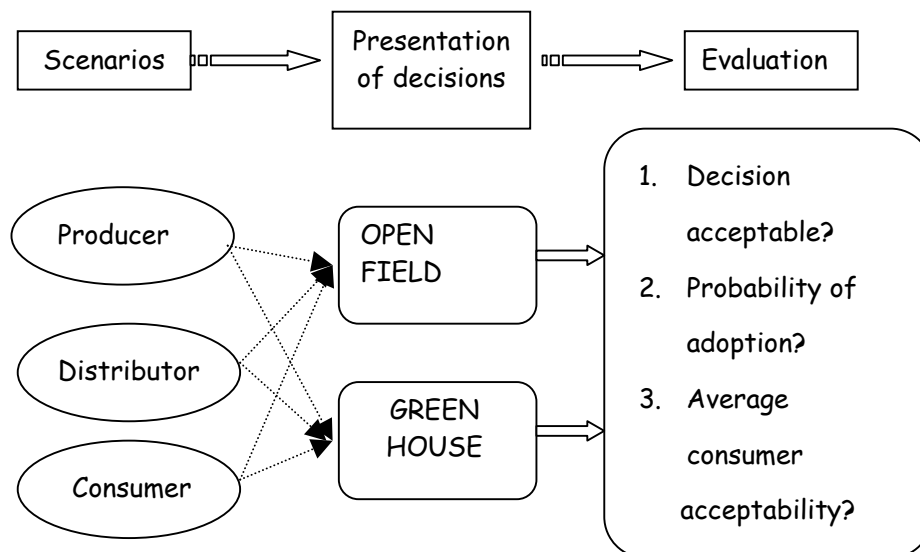


Figure 1: Scenario Method

Method of Holding Sessions

Each focus group lasted about an hour and a half and was moderated by two interviewers. The focus groups were filmed and recorded so that discussions could be transcribed after the sessions.

The study was conducted in three stages, with the alternating of individual and group work.

- The focus group began with a presentation of the research topic to the participants. Participants had to communicate in writing what first came to mind when they thought of tomatoes and the different methods of cultivation (open field, greenhouse).
- The second phase began with a review of the definitions and descriptions concerning the different methods of cultivation (see Annex 1). Written and oral participant reactions were recorded. Participants were called on by the meeting organizer to contribute.
- The third phase consisted of the presentation of several scenarios, for which the participants were asked to evaluate the different options.
- At the end of the session, a general discussion of the acceptability of different cultivation methods took place.

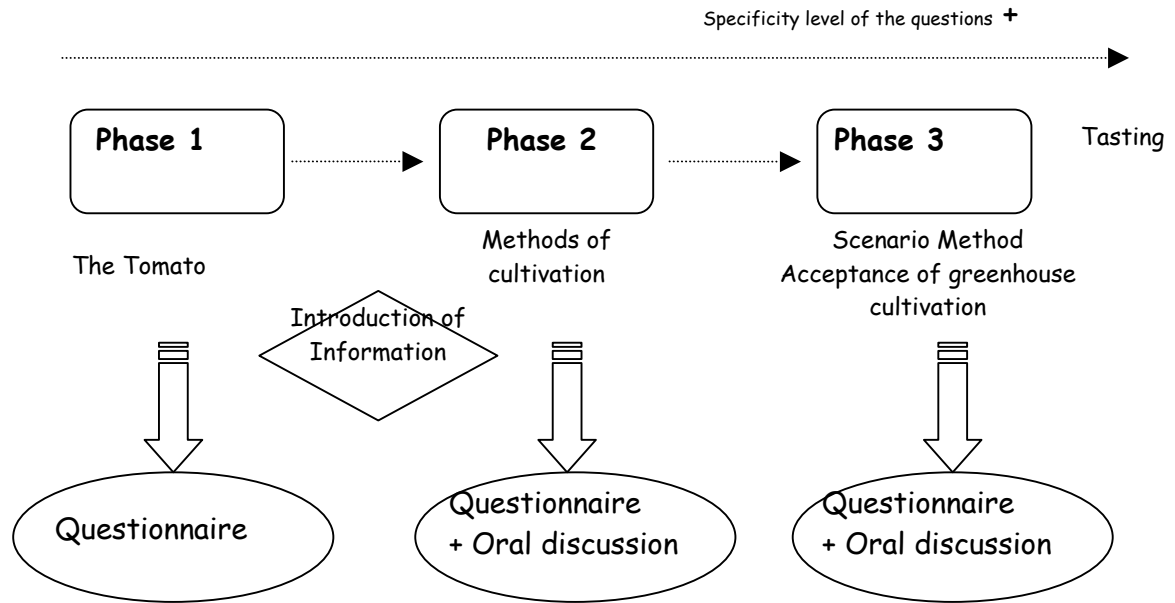


Figure 2: Session Holding Flow Chart

Data Processing

Most data collected from the discussion was evaluated using either classical content analysis or, for responses to more specific questions, with the use of a grid.³

The written and oral portions of the interview, after transcription, were analysed jointly, so that written responses were used to better understand what was said during the oral portion. To begin with, the corpus of responses was analyzed from a thematic point of view in order to generally focus on references to sustainability in consumer discourse, as well as knowledge and attitudes with regard to the different cultivation methods. Then an individual analysis was performed: the statements of each participant were studied in order to establish representational profiles. Lastly, thanks to responses obtained during the scenarios, we studied the different decision processes used by consumers in addition to the influence that the image of the producers and distributors had on the making of their decisions.

4. Focus Group Results

The focus groups allowed us to evaluate participant knowledge of and general attitudes toward the different cultivation methods, before and after being officially informed on the subject. Then we established various representational profiles of the modes of cultivation as viewed by the participants.

Knowledge of the Different Cultivation Methods

³ The following data was analyzed using Microsoft Excel: responses to Yes/No questions about knowledge, attitude, purchasing criteria, and personal statistics (age, sex, housing type, profession). A standard statistical analysis (difference, mean, standard deviation) was also conducted.

The majority of participants made the difference between open field and greenhouse agriculture. Only one participant admitted having never heard of open field cultivation:

“I wasn’t aware of the different types of cultivation. I thought that there was only greenhouse...” (Gilles, 23).

However, several participants did not differentiate between “open field” and “garden,” and placed open field cultivation in opposition to all other modes of agriculture without distinguishing between them.

*“I like the idea of open field agriculture... as for **the rest**, I’m not much for it”* (Nino, 34).

In general, knowledge of the various methods of greenhouse cultivation was weak. For those who were aware of them, the classification of cultivation methods was often: open field, hydroponics and imported produce. It can be noted that participants made no difference between “hydroponics” and “hydroponics with heated cloches,” generally of French origin; the same lack of differentiation was observed between “foreign produce” and “cold shelter in-ground cultivation.”

The level of awareness of the environmental impact caused by various methods of cultivation was rather weak. The following affirmations indicate the general lack of consumer awareness:

“I didn’t realize that fewer insecticides were needed in open field cultivation” (Odile, 48).

“Once you irrigate a field, the pesticides are washed away” (Jean-Pierre, 64).

“What surprised me was that all of the methods of cultivation are harmful to the environment” (Florian, 22).

In general, the people interviewed were conscious of this lack of awareness. Nevertheless, they showed some curiosity: *“And fewer pesticides, is that a scientific truth?”* (Nelly, 40), which could be interpreted as a growing interest in respect for the environment. However, they had a tendency to leave the tasks of evaluating environmental impact and determining a more environmentally friendly method of cultivation to experts.

“The truth is that we’re not..., we, we imagine ourselves... if it’s transportation that pollutes most, if it’s the heating in the greenhouse, if it’s the pesticides, if... we aren’t enough..., personally, I’m not informed enough on the subject to make any comparisons, to know what pollutes most. That’s my opinion, but...” (Gabriel, 36).

It is possible that this lack of awareness is a justification for not considering environmental impact as a criterion when making purchases (Ignorance is Bliss).

In conclusion, consumers are aware of the open field and greenhouse methods of cultivation, yet they get lost in the details of the different techniques employed in greenhouse agriculture. In general, a significant lack of awareness of the environmental impact resulting from these methods is apparent. It should therefore be noted that the first hypothesis (*Consumers are aware of and distinguish between different agricultural methods*) is partially validated whereas the second (*Consumers ignore the environmental impact caused by each agricultural method*) is fully validated.

Attitudes Toward the Different Methods of Cultivation

Where attitudes are concerned, analysis of the discourse revealed an idealization of open field agriculture, based on the themes of natural vs. artificial, taste and nostalgia, but also a recognition of the benefits of greenhouse cultivation. References made in consumer discourse about sustainability only came second, and mainly concerned the environmental and social aspects.

- Idealization of Open Field Agriculture: Natural vs. Artificial, Taste and Nostalgia

Open field tomatoes were often associated with the idea of *natural*, characterized in particular by the terms: natural, quality, colour, true, season, ripeness, health, sun, enticing, South, Mediterranean, etc.

“Open field agriculture means respect for the seasons, richer flavour, and it’s good for man” (Nino, 34).

In contrast, greenhouse cultivation was considered an “unnatural” method:

*“I’m not really much for **‘forced’ cultivation**”* (Annie, 43).

“A fruit that doesn’t get any sun can’t be better than one that does” (Benoît, 23).

“The greenhouse method is artificial and produces tomatoes even in winter, which is not natural” (Noémie, 23).

What’s more, people hold it to be true that due to their artificial aspect, greenhouse products are not as healthy.

After this initial natural vs. artificial opposition, the second theme pitting the two cultivation methods against one another was taste. The majority of participants expressed an unfavourable attitude toward the greenhouse method on the basis that the resulting produce has less taste.

*“The impression I have is that greenhouse produce has **no taste**, better to eat tomatoes in the summertime”* (Jean-Pierre, 63).

*“Greenhouse cultivation is not natural, it **doesn’t have any taste**, the tomato is full of water. There’s no advantage to it”* (Nino).

However, tomatoes from traditional fields were associated with a better flavour, with strong influence by nostalgic references to childhood.

“Garden tomatoes are the only ones that have “real” flavour, it makes me think of my childhood, of my grandparents” (Janine, 63).

“It makes me think of a green and red garden patch. I remember the taste of the tomato I harvested when I was little” (Odile, 48).

These personal experiences could explain, at least in part, the observed predisposition to idealize this agricultural method.

“My grandfather grew plump and juicy tomatoes in his garden. I visualize the field with propped stalks. It can’t be denied that field tomatoes are the most appealing, the most natural and respectful of the environment” (Odile, 48).

However, certain participants took a step back and realized this tendency toward the idealization of open field produce.

“Then again it’s true that maybe there’s less of an ideal than I think...” (Nelly, 40).

“They may be received ideas” (Janine, 63).

“It may be completely unjustified” (Odile, 48).

- The Relative Advantage of Greenhouse Agriculture

If the products of greenhouse cultivation were perceived as inferior for taste, certain participants justified the existence of this agricultural method by the advantages it offers, in particular product availability.

“As field tomatoes aren’t always available, greenhouse cultivation is necessary in order to have tomatoes all year round. Tomatoes that can be found in any season” (Gilles, 23).

Other advantages such as price were also often cited:

“Even in season, there are people who can’t afford field tomatoes... fortunately, sometimes there are greenhouse tomatoes” (Maryse, 45).

“Say what you will, soil-less cultivation actually provides the opportunity to meet a larger demand and to make produce available to everyone” (Janine, 63).

Consequently, several individuals described these methods of cultivation as complementary:

“They’re complementary, you’ve got to make the best of field crops in season and the rest of the time you’ve got to choose on the basis of quality and price” (Cédric, 33).

“They are distinct methods, but complementary, in the sense that they ensure regular supply” (Boukhalfa, 32).

Then again, finer distinctions such as: “in-ground” vs. “soil-less” appeared sometimes, among those who had a better understanding of the different methods of greenhouse cultivation.

“I avoid buying soil-less tomatoes. Beyond that, whether they are from a field or a greenhouse, it’s basically the same thing... if ever we find tomatoes that are produced without pesticides, without herbicides and from local agriculture” (Thomas, 27).

“Greenhouse growing in itself, I don’t really see any drawbacks, it only intensifies the power of the sun, of the heat. But it’s in soil all the same” (Marie H  l  ne, 50).

References to Sustainability in Consumer Discourse

Most oral exchanges and filled in questionnaires do not make explicit and direct reference to sustainable development. However, reflections on the origin of products and the social conditions of agricultural workers, as well as on the environmental impact of cultivation account for the “sustainability” concerns of the participants.

As far as origin is concerned, results are mixed. Certain participants associate products imported with the “South,” the sun, and thus have a rather positive image of these products. For the majority, however, local and domestic products are perceived as being of superior quality, and benefit from larger consumer confidence. In addition, they are described as polluting less. Imported tomatoes are often associated with the exploitation of labourers.

“What concerns me is the salary of the workers, and also the fact that they are exploited in foreign countries. I must say I don’t always think about it but now and then it comes back... It’s true that behind it all, there’s something disturbing” (Marie-Th  r  se, 60).

Clearly some of the participants have an aversion to certain regions, such as Almeria.

“The income is not proportional to the level of work demanded. Because I listened to a report on television, filmed about farming in the south of Spain and it’s true that it’s just not normal” (Claudine, 48).

However, the social conditions surrounding imported products and the environmental impact of transportation (“food miles”) are really not priorities in their discussions. The participants interviewed admit that for them these factors are not important buying criteria.

“I’m also sensitive to the fact that there are certain social injustices, people who are poorly paid... but, in my daily life, I forget about it” (Nelly, 40).

Concerning the environment, the factors perceived by the participants to be sources of pollution are principally pesticides, heating, transportation, visual impact and the wasting of water. The most important factor according to consumers is the effect of pesticides. Pesticides are perceived as harmful to the environment and to human health.

“It scares me, when we see that sanitary standards aren’t being respected” (Chantal, 54).

However, participants do not consider field cultivation as a method of agriculture that is highly dependent on pesticides, and are sceptical of information concerning the discrepancy between the levels of pesticides used for different methods of cultivation.

“And fewer pesticides in greenhouses, is that a scientific truth? Is it real?” (Marie-H  l  ne, 50).

Other arguments such as heating, visual impact and the loss of variety and of local agriculture are cited as factors justifying the objection to the greenhouse method. The association with “the greenhouse effect” is at the root of its negative reputation.

“On the other hand, heating, global warming, we talk about it all the time and it changes nothing; we continue to grow tomatoes by heating” (Florian, 22).

“The disadvantage of greenhouse growing, is that it’s expensive, because they need to heat them, the greenhouses. They aren’t greenhouses that heat up naturally... and indeed that pollutes” (B  atrice, 52).

“In the north of France, greenhouses are heated, they’re heated with gas... It’s not very logical, it doesn’t replace the sun” (Claudine, 48).

The visual impact is not frequently evoked. However, when it is cited, it is rejected by all participants.

“Also what is not mentioned there that bothers me a lot about greenhouse cultivation, whether they are heated or not, is landscape pollution. For me its very important to see fields without these pieces of plastic that pollute everything” (Danièle, 64).

“A greenhouse, it’s ugly, it’s the shiny plastic thing that reflects the sun back at you as you pass alongside it, it’s horrible” (Béatrice, 52).

In conclusion, consumers generally tend to think that a product from an open field is better than one from a greenhouse in terms of taste and health effects. In the same vein, support of traditional field agriculture is assumed to promote local production. Results are mixed when it comes to environmental and social aspects. Our third hypothesis is therefore partially validated.

The Role of Information: A Shared Interest

After reading a text explaining the environmental and social characteristics of the different cultivation methods, several participants began to incorporate these concepts into their decision-making criteria. For example, the apparent impact that this information had was greater as regards the environmental (67.6%) than social (50%) aspects.

“I think about the fertilizers that allowed for the cultivation of these little tomatoes... Do the tomatoes grown without soil really have the same amount of vitamins as those cultivated out in a field?” (Marjorie, 23).

“I pay attention to the amount of pesticides... because that’s what scares me, when we see that the sanitary standards aren’t being respected” (Nelly, 40).

However, the considerations for these aspects were not spontaneous for the majority of the people interviewed. Thus, on the one hand, the notions of “field tomatoes” or of “greenhouse tomatoes” did not make consumers think of environmental and social concerns. It was the image of the fruit itself (flavour, appearance, season, natural, etc.), its uses (consumption type), the place of purchase (open air market or supermarket) or even associations with the place of production (fields, greenhouses) that defined first impressions. The role of information is thus conclusive, it allows for a considerable broadening of the field of reflection in both space and time.

On the other hand, all participants found it useful to have access to more information. In addition, it was a subject of interest arising spontaneously in conversation:

“Maybe the consumer is not given enough information” (Marie, 36, Focus 2).

“At any rate, when we buy something, it’s not indicated whether we are buying open field or greenhouse tomatoes, we don’t know” (Maryse, 45, Focus 3).

So the lack of information was often evoked, the consumer desiring to be informed in order to make the best decision. When making purchases, consumers want to know the price, variety, origin, cultivation method (organic, field grown/greenhouse, in-ground or soil-less, etc.); such indications always constitute a reference that makes their choice easier.

*“We need better produce labels that indicate the **quality, cultivation method and origin**” (Hélène, 49).*

But the information must be visible, easy to understand and comprehensive, made with the intention of facilitating the choice between products.

“It’s when you buy the product that it’s the most useful to have information. I hardly ever do product research before going shopping... there’s a lack of information, but that information needs to be concise, because you can’t have 15 lines worth of label for every product...” (Benoît, 23).

There was also a demand that more detailed information be made available to schools and to the private (family) and public spheres as well through the use of information campaigns.

*“It’s a matter of **education**; it’s at the **family level, school level...**” (Nelly, 40).*

Several participants spoke up about the interest in informing the population, above all the new generations and medium-income households.

*“I have a friend from Mali, who has 4 children, she has a **modest income**... she buys junk food, that’s expensive, and that doesn’t have any nutritional value. It’s also a **question of choice**... if she had been educated in a different way...”* (Marie-Hélène, 50).

In conclusion, the introduction of information, over the course of a focus group, demonstrates that information increases the level of awareness about the environmental and social consequences of the different cultivation methods, but it also evinces the fundamental role of education. This validates the fifth hypothesis concerning the role of information while enlarging it and relating it to other less restrictive considerations (education).

Representational Profiles

On the basis of the interventions in the focus groups and the individual responses to questionnaires, we have established three consumer profiles:

The “Traditionalists” (21/34 participants) express a clear preference for traditional field agriculture, and are not ready to accept the greenhouse method. The degree of assimilation of information is less prominent than in the two other groups. Flavour and origin proved to be the principal decision-making criteria for purchase.

The “Spendthrifts” (7/34 participants) have a more moderated aversion to the greenhouse method: the method is probably accepted if the relationship between quality and price is interesting. This criterion is otherwise the most important at the point of purchase; other characteristics such as origin, environmental and social conditions are not taken into consideration when they make choices.

The “Responsible” (6/34 participants) have a clearly superior level of knowledge about the methods of cultivation. When compared to the two other profiles, this group is more inclined to accept greenhouse cultivation. The extent of the impact that the information has is higher for the individuals of this group. Concerning the order of importance of buying criteria, respect for the environment and social equality are crucial, taste for the first time being considered second to these.

5. Scenario Study Results

Three scenarios were proposed. The participants were asked to put themselves in the shoes of a tomato producer (Scenario 1), a distributor (Scenario 2) and a consumer (Scenario 3). Each person could make several decisions and the participant evaluated each of them. To begin with, he rated the decision according to his personal opinion or “ethical”⁴ value, then according to the probability⁵ that the decision would be made. Finally, he assessed whether the decision corresponded to the expectations of the average consumer (Consumer Acceptability⁶). The ratings indicated in the following tables give the average values resulting from individual ratings. In order to justify the rating given to each decision, the participants were allowed to explain their responses.

One last open-ended question was proposed allowing each participant to add decisions that were not considered.

- *A producer perceived as economically concerned wanting to maximize his profit above everything else*

The first scenario presents the situation of a French producer who hesitates to change his method of cultivation.

⁴ Ethical Value: the ethical value of the decision (from 1 to 5, with 1 = unjustifiable position and 5 = ideal decision).

⁵ Probability: the probability of adoption of this decision (from 1 to 5, with 1 = impossible decision and 5 = ideal decision).

⁶ Consumer Acceptability: level of acceptability for the average consumer (from 1 to 5, with 1 = does not suit him and 5 = suits him completely).

Options	Ethical Value	Probability	Consumer Acceptability
1. He decides to continue with his open field cultivation because he considers that production conditions are more natural and that he doesn't have the means to invest in greenhouses for his tomatoes.	3.9	3	3.5
2. He decides to continue with his conventional method of cultivation because soil-less greenhouse production requires higher energy consumption and therefore plays a higher part in the exhaustion of natural resources.	4.1	2.8	3.6
3. He decides to convert to soil-less production in order to be able to regulate his production, control cost, quantity, organoleptic and health quality, and to be able to sell year-round.	2.5	3.8	2.8

Table: “Producer” Scenario Average Ratings

For each of the producer's decisions, the table lists the ratings given according to ethical value, probability, and consumer acceptability.

Options 1 and 2 received very positive ratings, with consumers thinking about the long-term results with “a farming method that's more natural and more respectful of the environment.” Option 3 was the least satisfying. The lack of ethical and environmental consideration on the part of producers was not appreciated. However Option 3 was perceived as the most probable, the farmer being apparently identified as driven by economic considerations and only trying to maximize his profit.

In all options, the difference between ratings for “ethical value” and “consumer acceptability” was weak. However, “consumer acceptability” ratings were closer to each other, as the participants proved more prudent: when it comes to evaluating the acceptability of the decision for other consumers, they showed themselves to be more moderate in their evaluations. The participants in this study did not consider themselves average consumers and placed themselves in a more affluent category.

“I don't know about that. We are, perhaps, in a more privileged social class, but there are people who don't have the means to buy high quality tomatoes” (Maryse, 45).

“I get the impression that we represent the minority ...because it's true that if we are here it's because we are more conscious of the situation” (Nelly, 40).

Thus, when it comes to reasoning as an average consumer, economic considerations such as a lower price, or the availability of out-of-season produce, take precedence.

- *A distributor considered as principally interested in financial aspects*

The second scenario presents the situation of a distributor who hesitates between different options:

Options	Ethical Value	Probability	Consumer Acceptability
1. He promotes the field tomato by announcing that his prices are higher than for the greenhouse tomato because it is of a better quality and helps support local producers.	4.3	2.7	3.4
2. He promotes the imported tomato by announcing that it is cheaper.	2	3.7	3.1
3. He promotes the greenhouse tomato produced in France by explaining that it is more expensive than the imported tomato but better for the environment and that it helps support French producers.	3.3	2.9	2.9

Table: “Distributor” Scenario Average Ratings

For each of the distributor’s decisions, the table lists the ratings given according to ethical value, probability and consumer acceptability. The first option was the most readily chosen, the one that was perceived to be an ethical and honest decision, promoting the quality of the product. The lack of ethical and social consideration in addition to ignorance of the origin of the product at the time of purchase made Option 2 the least popular. Option 3 ranked in between the two. Support for French farmers was generally well-perceived and environmental protection promoted the choice of this option as well. The estimation of probabilities was inversely proportional to the participant’s personal value, the option the least appreciated being perceived as the most probable. The distributor only seemed to consider the financial aspects, ethical considerations ranking second.

- An “average consumer” who favours the power of choice when faced with ethical considerations, yet without excluding them

The third scenario presents the situation of a consumer who buys his tomatoes at the supermarket during the summer months. The store proposes greenhouse tomatoes and field tomatoes.

Options	Ethical Value	Probability
1. The consumer chooses the tomato labelled “field tomato” because it is natural, flavourful, and locally grown, even if it is more expensive and less “attractive” than the others.	4.2	3.2
2. The consumer chooses the tomato labelled “greenhouse tomato” because he is in the habit of doing so (because it is available all year round), and because it seems more homogenous and regular and always tastes the same.	2.3	3
3. The consumer chooses the tomato labelled “greenhouse tomato” because it is grown using a method that limits the use of phytosanitary products and it supports French producers.	3	2.5
4. The consumer chooses the tomato that he feels offers the best quality-price ratio, without knowing if it is grown in a greenhouse or in a field, produced in France or imported.	2.9	3.8

Table: “Consumer” Scenario Average Ratings

For each of the distributor’s decisions, the table lists the ratings given according to ethical value and the probability of adoption. Option 1, a “natural and local” tomato, was perceived as ideal. Nevertheless, the chances of this tomato being chosen are mediocre. The habitual choice of a standardized tomato (Option 2) was not popular, but nevertheless remained possible. However, a greenhouse tomato grown locally was more readily accepted (Option 3). In contrast, the argument for environmental respect was apparently unconvincing. The probability of adoption was lower than for the other cases. The last option, despite the ignorance of origin and the lack of ethical consideration, was considered the most probable. The most usual justifications were the lack of information on product labels and ease of choice.

In conclusion, the **Scenario Method** allowed us to study how the consumer evaluates the decisions made by the producer and the distributor:

- Decisions responding to the **goal of economic rationality** are evaluated **negatively** in the case of the producer and of the distributor because ethical and environmental considerations are not taken into account.

- Appreciations are **different** when the participants evaluate the choice of the **consumer**. In general, we notice a less severe judgment, a choice guided by price being considered acceptable.
- The **probability** of adopting a decision only based on profitability criteria is the **highest** for the three scenarios (producer, distributor and consumer).
- The majority of participants identify **field production** with the **small farmer** settled onto his land living in total respect of nature, while the **greenhouse producer** is rather seen as a **businessman** looking uniquely to turn a profit.

Discussion, Theoretical Implications and Research Practices

The clear preference, even the idealization of the open field in comparison with the greenhouse method confirms a preference for the natural as evidenced by the work of Rozin *et al.* (2004).

All references to instrumental beliefs can be found in the consumer discourse on field tomatoes: they are considered better because 1) human intervention damages nature, 2) what is natural is healthier, 3) natural products have more flavour, 4) what is natural is purer and thus healthier. The last two beliefs, related to the moral or aesthetic superiority of choosing natural, are not so clearly stated, but do appear in the responses of certain participants who reject greenhouse cultivation solely because it is not natural, and that natural is intrinsically better.

The discrepancy between the attitudes expressing a consideration for environmental and social characteristics and the criteria actually used at the time of purchase (price, appearance) may be explained by the techniques of neutralization as pointed out by Chatzidakis, Hibbert and Smith (2007). More precisely, two are found in our study:

- The focus groups introduced the resort to “another priority”: consumers explain the fact that their choice at the moment of purchase does not take into account sustainability criteria because of revenue constraints (“*Even in season, there are people who don’t have the means to buy field tomatoes*” Maryse, 45) or by the fact that this criteria is not important at the moment of purchase (“*I’m also aware of the fact that there is a certain level of social injustice, poorly paid people... but, in my daily life, that I can forget about*” Nelly, 40).
- The denial of responsibility also surfaced in the scenarios: the producers and distributors are considered to be interested only in making a profit, yet the consumers are not considered as responsible for the lack of sustainability of the system that they encourage with their purchases.

This technique of denying responsibility may in addition be related to the concept that “ignorance is bliss” already evidenced in studies on the environmental concerns of consumers (Sirieix *et al.*, 2008). The lack of awareness of a system or of its consequences may serve as justification for not considering environmental conditions as buying criteria:

“The truth is that we’re not... we ourselves can’t figure... if it’s transportation that pollutes the most, if it’s the heating in the greenhouse, if it’s the pesticides, if... we aren’t enough... me personally, I’m not informed enough on the subject to make any comparisons, to know what pollutes the most. That’s my opinion anyway” (Gabriel, 36).

Practical Implications

The three profiles are representations of consumers that allow us to define the conditions that would increase the probability of the greenhouse method being accepted by each category of consumers.

Traditionalist: People coming from rural areas, older persons and women tend to belong to this first category. Greenhouse cultivation is understood to be a rupture with the land, the seasons and conventional methods; in

other words, a rupture with the known world. What's more, the tomato resulting from this method is described as tasteless, full of water and artificial. In order to improve this rather negative image, it will be necessary to dissociate the identification whereby "greenhouse" tomato = "artificial" tomato. In order for that to happen, it will be necessary to continue on the path of improving organoleptic characteristics, while promoting the cultivation of varieties highly appreciated for their flavour, with the goal of identifying them with those grown in traditional fields. The diversification of the form is also a question to be considered. An excessively homogenous tomato is negatively perceived by this group of people, accustomed as they are to garden tomatoes that tend to vary in form.

These people consider flavour and origin in priority when making purchases, often even putting the origin of the product before everything. In this way, a crop coming from a regional or domestic greenhouse may be preferred to imported field-grown produce. In that case, the image of the greenhouse method could improve noticeably by communicating on the link between the producer and the local area and its importance for the economic and social development of the region.

Finally, we note a remarkable lack of awareness and mistrust of the advantages of using greenhouses. It would be interesting, especially for people who are much concerned with their health, to offer reassurance that the level of pesticides and chemical fertilizers used for this method is low.

Spendthrift: This group is composed principally of persons aged 20 to 40. In general, these individuals, more detached from nature and traditional values, are more interested in other criteria such as affordable pricing and an attractive-looking tomato. Characteristics like origin, or environmental or social respect do not play a critical role in their decision-making.

Despite their preference for field tomatoes however, the extent to which they reject the greenhouse method is moderate. For this profile, it would be important to pursue the politics of pricing, while improving the perceived cost benefits of the product, understood to be a more advantageous quality-price ratio. In the same respect, clearer and more concise information (promotions, labels, etc.) would facilitate their choices while saving them time, thus constituting another motivating factor.

Responsible: This group is composed of consumers under 50 years of age. This profile seems ready to accept the greenhouse method. Environmental and social questions are important in their choices. This proves the existence of a real demand for a system of production that is more respectful of the environment. It would thus be interesting to promote the environmental advantages that go along with the use of greenhouses.

In addition, the lack of information about the cycles of natural production, the lack of awareness of varietal diversity and of its disappearance, and the new eating habits are subjects of concern for those interviewed. The consumer wants to be better informed on the price, variety, origin, and cultivation method (organic, open field/greenhouse, in-ground or soil-less) in order to make the best decision. However, the idea is not to provide an exhaustive list of indications at the market/supermarket. The "practicality" aspect is fundamental, the information must be visible, easy to understand and comprehensive with the goal of facilitating the choice of products.

In addition, participants also indicated the necessity for a broader basis of information to be made available to schools and the private (family) and public spheres as well through the use of information campaigns.

Information and education are thus leverage that actors in the fruit and vegetable sector may use to foster a change in consumer behaviour. Information made available at the point of sale must be simple, but so far it seems to be insufficient; it must be supplemented by awareness campaigns upstream.

However it is necessary to question the pertinence of an "education" aimed at improving consumer behaviour. The practicality, gustative qualities, pleasure and conviviality are arguments that still require to be developed for the promotion of fruits and vegetables. As with nutritional politics, the difficulty lies in the integration of sustainable development goals into political action without assuming a "moralist" angle which—like the hygienist approach in the case of nutritional policies—will most likely prove to be ineffective.

Conclusion

The aim of this study was twofold. The first objective was to study the way in which French consumers perceive fruits and vegetables, local or imported, resulting from traditional field or greenhouse methods, from a health, hedonic and sustainability point of view. The second goal was to identify more specifically the obstacles to and conditions of acceptability for greenhouse agriculture from a sustainable development perspective. To this end, the working hypotheses were formulated based on knowledge of agricultural methods and of their environmental impact, on the attitudes vis-à-vis the methods of cultivation, on the buying criteria and on the role of information.

To validate these hypotheses, the methods employed (Focus Groups and the Scenario Method) led to the following conclusions:

- Consumers have a knowledge of the open field and greenhouse methods of cultivation, but they get lost in the details of the various techniques employed in greenhouse agriculture.
- Consumers are significantly unaware of the environmental impact of these agricultural methods.
- Consumers, in general, feel that open field produce is better than greenhouse produce in terms of taste and health effects. On the same note, traditional field agriculture is assumed to support local producers. Where environmental and social questions are concerned, results are less cut and dry.
- Information improves the level of awareness of the environmental and social consequences of the various agricultural methods. But consumers also emphasized the fundamental role of education.

On a more general level, this study brought to light the negative image associated with greenhouse growers. They are often perceived as businessmen interested only in turning a profit, as opposed to the open field producers who are perceived as small farmers settled onto their land living in total respect of nature. This negative image held by consumers is thus in need of modification.

The study also exposed an interest in not being limited by the distinction between open field and greenhouse. If we consider the opposition in-ground/soil-less, it would appear that in-ground cultivation is viewed rather positively by consumers, being regarded as more natural. The objection to this method being weaker, it would be beneficial to promote greenhouse in-ground methods such as tunnels as “in-ground” cultivation.

Keeping successive studies in perspective, it would be interesting to reinforce this approach with other methodological tools such as a quantitative study, a diversification of the setting where the study is performed, and a direct observation of behaviour. In addition, investigations founded on psycho-sociological or even philosophical approaches to food could further solidify the initial results while exposing the significance of ordinary practices too often considered only in their mechanical dimension.

Annexes

Annex 1: Phase 2 Document

Some General Information Details

Open field or in-ground agriculture offers the most natural conditions of production (air, water, sun); it is the assurance of a production that respects the “natural” cycle of plant culture, but it makes it difficult to manage quantity, especially over a rather short production period. Tomatoes are only available in season but they taste better.

Soil-less greenhouse cultivation is much easier to control, organize, and even program; it is sheltered from the climate risks that affect open-air fields. Tomatoes are available year-round, and there is no surprise: the appearance is always regular, the taste is consistent, and the price affordable considering the quality. For the distributor, it allows for more flexibility in supplying the customer, which alleviates stocking fees and thus cuts costs. However, this method of cultivation requires considerable investments and therefore high production results. It has environmental repercussions due mainly to heating, but cuts down on the use of pesticides.

Imported produce coming from southern countries, notably Spain or Morocco, are products of in-ground greenhouse production; they are acquired at rock-bottom prices but the wage-earning conditions of the farm hands may not always be sufficient, crop protection requires more attention than for heated greenhouse production and the transportation involved has environmental repercussions.

Annex 2 The Tomato Market

Second only to the potato, the tomato is the world's **most cultivated vegetable** representing 1/6th of all vegetable production. Fifteen countries of the EU produce 15.5 million tons of tomatoes with Italy, Spain and Greece representing close to 80% of this production (of which 2/3rds for agri-food). The CTIFL (Inter-professional Technical Centre for Fruits and Vegetables) estimates European production of tomatoes for the fresh produce market to be at 6.5 million tons.

French production levels amount to 900,000 tons per year, of which 62% is destined for the fresh produce market. Greenhouse tomatoes represented 85% of the French crop in 2005. The principal zone of production for tomatoes destined for the fresh produce market is the Southeast with 45% of national production. France is the second major importer in the EU and ranks fifth as exporter, the trade balance thus being in deficit. Imports mostly from Morocco and Spain (basically during winter and autumn) represent 40% of the marketed quantity.

In terms of trade circuits, **61.1%** of total tomatoes sales are made in **supermarkets**. Two strategies predominate in the world of tomatoes: a qualitative strategy looking to satisfy consumer expectations and a quantitative one concerned with low prices.

In France, the tomato is one of the **most consumed vegetables**, coming just after the potato. Per capita consumption of fresh tomatoes comes to **12 kg/year**. The level of autoconsumption (close to 30%) is not negligible. Tomato consumption level is high in the peak season (May to September). Concerning the distribution of consumption according to age, households aged 35-49 and 50-64 are those who buy tomatoes for their quality, whereas young people represent the category that consumes fewer tomatoes.

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