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Plant-Based Meat in The Mexican Market:
An Empirical Analysis

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Introduction

One of the most basic ways to divide living beings is according to their specific eating diet, these diets are usually divided into three main categories: omnivores, carnivores, and herbivores. When each of these categories and their subcategories obtain its name by the type of food consumed in that category.

In some cases, these food diets can even be recognized because they highlight certain physical characteristics of the beings that consume them. For instance, by observing the features of the digestive system organs such as stomach, intestines, and colon we can distinguish between a species diet.

In the case of pure herbivores as well as pure carnivores species we can observe a particular metabolic and psychological fit according to their diet. However, human beings suit none of these previous mentioned categories but rather fits between them, our species is a classic example of omnivores, meaning that according to our relevant historical and anatomical aspects we can eat meat as well as vegetable food.

Heterogeneous fields and numerous scientific studies have contributed to the understanding of human diet evolution and the role of food in the development of our species.

At the beginning of time our species mostly depended on hunting other animals and thus consuming their meat in order to obtain food, proteins and clothing. However, at that point in time this was not the only way of getting food, it is well-know that human beings also collected plants, grains, and seeds to complement their eating and surviving needs.

Through time, human diet has evolved, adapting to very different global climatic conditions as well as environmental and historical circumstances. Early human diet was highly dependent on external factors and thus the availability of it was not controllable by human beings, the natural characteristic of human to seek need satisfaction led to the important transition from hunting and collecting into

agriculture, which was a more controllable method of obtaining food and within it came an important dietary change.

The addition of agriculture into human life brought many pros and cons, the main advantage being that humans were not driven anymore to consume whatever they find or is more convenient for its survival, but they rather have the possibility to choose and grow or rise a specific food they wanted to consume.

Unfortunately, on the other hand, the abuse or misuse of agriculture has been linked to negative contributions to environmental issues such as greenhouse gas emissions and excessive use of water and land. In addition, massive agriculture has also been related to health issues such as foodborne and other infectious diseases as well as antibiotic resistance.

So, nowadays we have almost an instant availability along with a huge variety of different foods and much information about the potential benefits and detriments of the different types of diets giving us the necessary competences to choose the best diet according to our needs.

Deciding between diets that promotes meat consumption or a diet which favors plant-based meat consumption could be a challenging job, both diets have their advantages and disadvantages depending on the different consumer needs. Convenience, price, taste in addition to the consumers attitude towards global problematics such as large-scale meat industrialization issues, human health concerns, environmental and animal welfare are some of the main characteristics an individual consider when choosing a diet.

In recent years there has been a notable increase in the demand for meat analogue products and one of the most outstanding products in this industry are the so-called plant-based meat which in recent times have gained a lot of popularity because of the different benefits offered that traditional meat does not include.

Plant-based eat is an alternative of meat made primarily by vegetable-based food products that attempts to replicate in the taste, look and proteins that we can usually obtain on traditional meat.

Some of the main arguments for the adoption of plant-based meat diet are usually related to ecological, ethic and health issues. Nevertheless, the broad acceptance of meat analogues or substitutes deals with several barriers that difficult their acceptance in a day-to-day basis, a common barrier being that population is usually poorly informed or completely unaware about these types of products and hence are relatively new for the consumer.

Developed countries tend to have a higher interest and demand for plant-based meat products, in fact regions such as Europe and North America occupy the vast majority of the global market for such products. On the contrary, meat consumption in developing economies such as Mexico continues to rise while the interest and demand for plant-based meat products remain low.

As a Latin American, but also a North American country Mexico has been widely influenced by the United States of America, the country has experienced one of the most rapid changes in diet habits, mainly due the influence of the so-called American diet and the increasing lack of physical activity thanks to modern tools and lifestyle that have encourage a more sedentary life in Mexicans.

Mexico has undergone a transition going from being a country dealing with malnutrition and parasitic diseases to a country with unhealthy diet-related diseases many of them linked to meat consumption like diabetes and obesity. For instance, the adoption of plant-based meat could benefit Mexican's health, however, it still seems to be a niche product in the country since only certain consumers in the Mexican market are aware of their existence.

The author, as meat consumer himself and native from Northern Mexico where meats are an important protagonist on the daily and cultural diet found the concept of plant-based meat to be something new. In this region where heavy-meat consumption is very common and from a city where one of his main traditional dishes is grilled meat, the author was surprised by how little known the concepts of plant-based meat or alternative to meat was for him.

During the research prior to this thesis and to the knowledge of the author, there is no study directly focused on studying the perception and attitudes of the Mexican

consumer towards plant-based meat, leaving room for more research exploring on this topic.

The fundamentals of consumer behavior as well as the perspectives with which the factors that influence the consumer in their decision-making process are explored with rational and habit theories as well as disciplines such as behavioral economics in order to have a clearer view of why a consumer decides to make certain action.

The thesis considers consumer behavior theories to examine the relation of the Mexican consumers with plant-based meat and performs an empirical analysis on a primary database collected by a structured online survey conducted to 201 participants.

To understand what consumers about this concept in the Mexican market and their willingness to accept is fundamental collect and analyze the data from the primary research.

The information gathered from the survey describes and offers insights on the perception and acceptance of the Mexican consumer contributing to the understanding and future development of plant-based meat in the Mexican market.

In addition, as an overall this study expects to contribute to further investigations on plant-based meat consumption in the Mexican and Latin American markets as well as in other developing economies and serve as a primary research study for future analysis.

Chapter 1: Consumer Behavior

Consumer behavior is a relatively new discipline, until the 1950's the concept was regarded as a subtopic of other disciplines such as marketing studies. The discipline was initially adopted as a descriptive approach which consisted of observing what the consumer does in specific situations.

When motivational studies emerged, deriving from sociology and psychology and consumer behavior adopted a prescriptive approach consisting not anymore just about observing what people do but rather studying why people act in a certain way, the new goal was to understand why consumers were behaving in a certain way, why are were they purchasing some specific products and not purchasing others.

Now, consumer behavior is a distinct field of research, touching heterogeneous literatures such as marketing, sociology, and phycology. Today, the study of modern consumer behavior is key to operate business since it is essential to know in detail what the consumer is doing and gives the possibility to the business owner to make inferences and know on which levels to act in order to change behavior, so it is consistent with his goals.

1.1 Rationality

Under the early economic theories consumer behavior was completely absent except for a few neo classical approaches in microeconomics, however, this approach tried to provide laws but in consumer behavior there are cognitive limit agents that oppose to rationality. Under microeconomics the consumer is commonly considered to be a homo-economicus, that is, a perfectly rational individual who always seeks to maximize his utility since it is assumed he or she knows all the information, advantages and disadvantages, as well as all the different alternatives when purchasing.

However, this is not true in real life since as previously mentioned the real consumer is irrational and is affected by internal factors such as their values and habits or eternal factors such as changes of society like digitalization and sustainability and the individual chooses influenced by these.

The interdisciplinary branch of behavioral economics has shown in fact that humans are not rational as the classical economics suggested, behavioral economics support that we act according to values and other irrational factors.

This discipline studies social aspects and the effects that psychological factors have on our decision-making processes in order to helps us understand how people behave and why they behave in a certain way, in other words it helps us to predict human behavior.

Many other disciplines such as marketing rely on behavioral economics to frame effective messages and to play mind games with consumers.

Thanks to behavioral economics we have been able to demonstrate the psychological factors that affect us when buying a product, as well as the situations that affect us the most. For instance, in marketing has been key to understand that a consumer get more affected when he loses something rather than when he gains something, that consumers have emotional attachments with products or that consumers don't like to be overwhelmed with excessive information.

An important author that used a behavioral approach to economics was Herbert Simon in 1916 who introduced the concept of bounded rationality. Simon challenged the idea that humans where just irrational as implied by the concept of homo-economicus with a conception of rationality which is tailor to cognitively limit agents since most of the time we don't have all the resources to get all the information to make the best decision that maximizes utility. Simon concluded that we are creatures of habits and instinct and arrived at the conclusion that humans are not complete irrational, but creatures that tend to satisfy our needs rather to maximize utility.

1.2 Sustainability

Is not easy to properly define a sustainable responsible consumer since sustainability is per se a complex and multifaced process made from many building blocks and different pillars such as the environment, ethics, and so on.

There has been a sort of evolution over time of what we mean when we talk about sustainable consumers. The first type of sustainable consumers was labeled as

"green consumers" since they showed a specific interest in the ecological aspects of the products and their processes that they consumed.

However, although the environmental part is important for sustainability, the ethical factor has great importance and should be considered.

The socio-ethical side added some value to the definition of sustainable consumers and labels themselves changed overtime, going from being a consumer that considered only the environmental side to an ethical focused consumer.

Ethical covers a broader range of issues and more complex decision-making process. It extents the definition of green consumer that mainly considered the functional aspects of the product by adding the focus on the people perspective going from ethical issues like labor standards and fair trade.

The evolution of green consumers, where known as socially conscious consumers, this type of new consumers was typically interested in both environmental and in ethical aspects of purchasing and consumption, besides of course traditional price, and functional related functions.

So, we can call it responsible consumer to the consumer that is interested in both in aspects of environmental sustainability and social responsibility.

Unfortunately, it is not easy indeed to analyze responsible consumer behaviors, a common mistake is giving the sustainability responsibility of a specific consumer or individual as something static or given for granted, so, the consumer is either sustainable or not.

However, it is necessary to approach this from a flexible and holistic perspective.

Flexible since the consumer may be responsible in some circumstances and not in others, or they may be responsible to some extent according to the conditions of the situation.

And holistic since people evolve over time so an individual who might not be interested on sustainability today might be interested in the future, so, we should consider a room of improvement for every segment of people.

1.3 Consumer behavior approaches

There are 3 main different approaches to study consumer behavior.

1. **The rational approach** also known as the microeconomics approach

Considers the behaviors as a result of rational economic calculations and although it is not realistic contemplates that the consumer knows all the alternatives, the information, pros and cons of each single product and therefore the consumer always maximizes his utility.

This type of approach does not consider habits, values, regrets...etc.

2. **The behavioral approach**

This approach observes what people do in certain situations and analyzes why. Usually is implemented as follow: implement some communication, observe, and analyzes.

3. **The cognitive approach**

It goes deeper than the behavioral approach since it not only observes what happens but tries to understand why individuals act in a certain way so that we can change strategies or communication depending on our goals.

1.4 Analyzing consumer behavior

Segmentation based on socio-demographics was one of the first attempts for analyzing consumer behavior, was based on observing and investigating the behavior of people and their social demographics in order to find an ideal profile of the customer.

This methodology provided some insights, but it was superficial. So, specialist decided to shift from social demographics to values.

Adding values give us a better analysis of consumer behavior, when analyzing values connected to sustainability it is important to adopt scales, for example the New Ecological Paradigm scale which consists of 14 statements that respondents must answer if they agree or disagree on a Likert scale and analyzes the relationship you have with the environment in society revealing what kind of person you are and your sustainable worldview)

To analyze the Likert scales, it is not enough to create an average, it is necessary to verify that all the questions go in the same direction, and if not, modify them by doing reverse coding so that they can be compared.

Behaviors in general, are affected by 2 big families of theories: rationality (intentions) and automaticity (habits). Some theories suggest that our behaviors stand either from intentions or from habits. However, depending on the specific person and a specific behaviors intentions or habits may play a determinant job.

Intentions and habits have as predictors different variables:

- **Individual sphere:** what happens inside of myself (my values, my attitudes)

- **Relational sphere:** what is the image I want to project, what does other expect from me...

- **Contextual sphere**: the price, the opportunity the availability of product...

We can find two different theories that try to explain consumer behavior from different approaches: the rational or intentional and the automaticity or habits theories.

Figure 1.1 Consumer Behavior
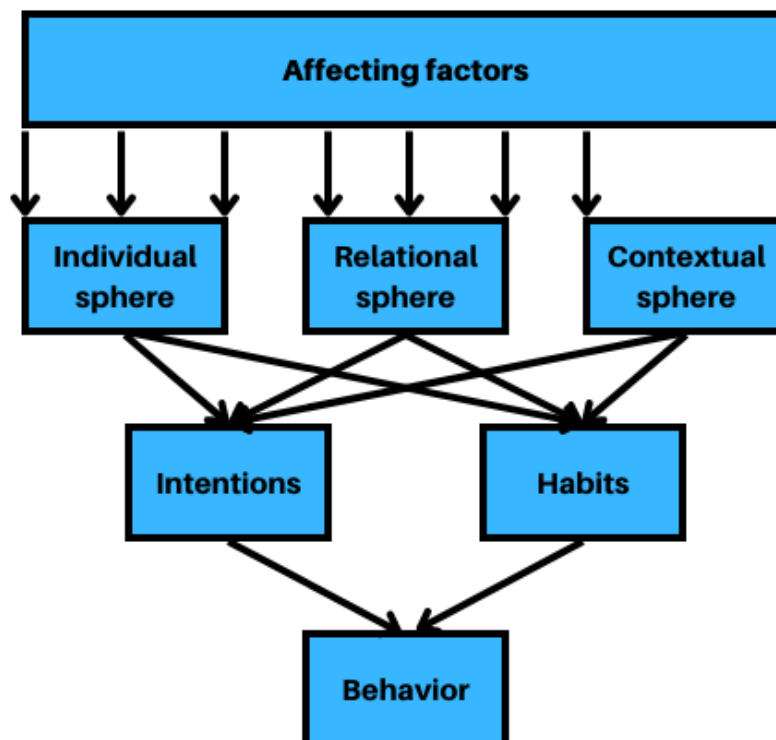
Source: Pierto Lanzini, "Consumer Behavior" Lecture, Ca' Foscari University of Venice, 2021

1.5 Consumer behavior theories
1.5.1 Rational and Intentional

In early research of consumer behavior, it was assumed that intentions meant behaviors, however this was not completely true, there is a gap since there exist a discrepancy between intentions and activities performed by consumers

The Theory of Reasoned Action (1975)
The theory of reasoned action (TRA) can be considered as one of the pioneering theories of consumer behavior, the theory has also served as a base that has been modified by more recent theories nowadays used to investigate consumer behavior.

TRA was born our environmental and sustainability studies based under rationality designed to deal with behavior in general. Under this theory behavior depended on intentions and so that the individual stops the intention of doing something, he is influenced by two elements, his attitude towards the act or behavior and the subjective norm.

The individual's attitude towards an act or behavior pertain to the individual sphere because is something that has to do with the individual's subjectivity, it is the result of the combination of my believes of which will be the outcome of certain activity and how do I evaluate this outcome.

While the subjective norms pertain to the relational sphere, since it reflects social pressure, making the individual ask himself if the people around him would like or dislike him by adopting certain behavior.

Sometimes attitudes and subjective norms operate in the same direction and sometimes no making it more complex for the individual to make a decision, in this case we need to investigate which of the two motivations the subjective or the social is more important for the individual.

In conclusion, the theory stated that an individual do something as long as he intends to do something, and he develops the intention to do it when he has positive

attitudes and subjective norms that go in that direction. And in the case attitude and subjective norms operate in different directions, the individual will be consistent with the force which is stronger."

Yet, this theory is not realistic and superficial since it doesn't consider if you are able to do it or not. (Resources, availability…) and it assumes that all behaviors are under collisional control, in other word the theory implies that if you want to do something you can do it when I have positive attitudes and subjective norms that go in that direction

Since, intention is necessary, but not sufficient, in order to have a development of a behavior.

Figure 1.2 Theory of Reasoned Action
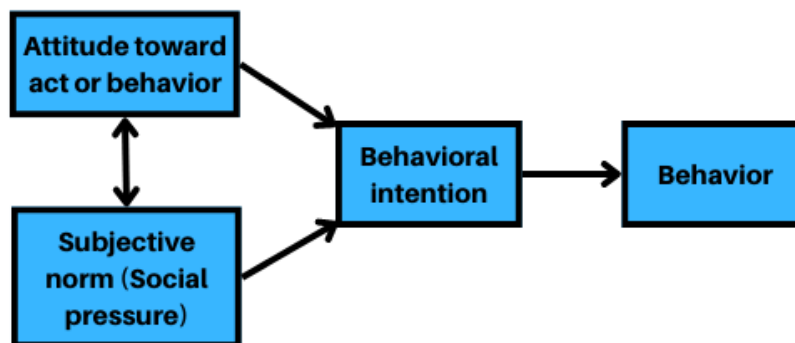
Source: Pierto Lanzini, "Consumer Behavior" Lecture, Ca' Foscari University of Venice, 2021

Theory of Planned Behaviors (1991)

This theory is considered to be an evolution of TRA which adds as an antecedent to intentions and behaviors the perceived behavioral control where the individual analyzes and realizes if he is able or not to behave or do certain action.

The term "perceived" is important since sometimes there is not a real difficulty to do something but rather a personal perception of difficulty.

Figure 1.3 Theory of Planed Behaviors
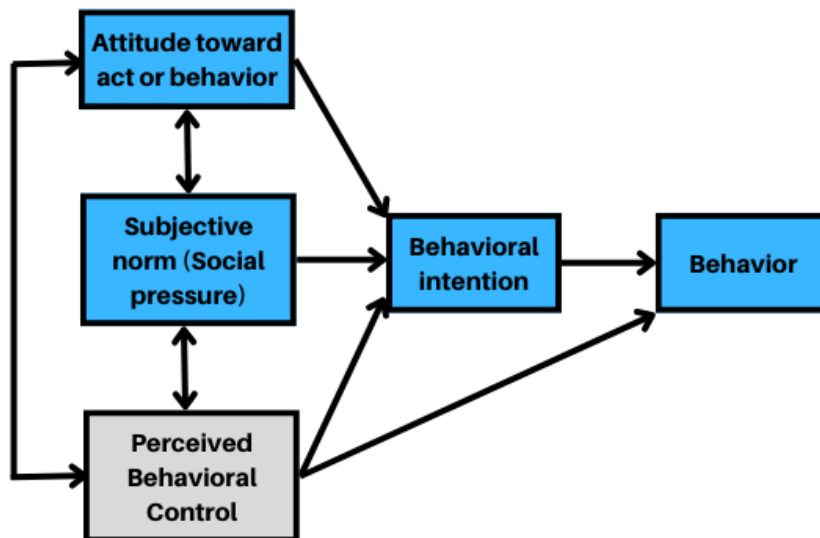
Source: Pierto Lanzini, "Consumer Behavior" Lecture, Ca' Foscari University of Venice, 2021

Norm activation model (1977)

This model is devoted specifically to behaviors and activities who are relevant from a sustainable point of view. This model stated that intentions depend on personal norms (feeling of moral obligation to do something or to avoid doing something) which are the antecedents of intentions which still are the antecedents of Behaviors.

Two variables activate personal norms:

1. Awareness of consequences: how much am I aware about what are the consequences on society or the environment of me doing something.

2. Ascription of responsibility: having high awareness of the consequences and you feel personal responsible for it.

The combination of awareness of consequences and ascription of responsibility, then you activate personal norms feeling morally obliged to change your behaviors to become consistent with this responsibility idea

Figure 1.4 Norm Activation Model
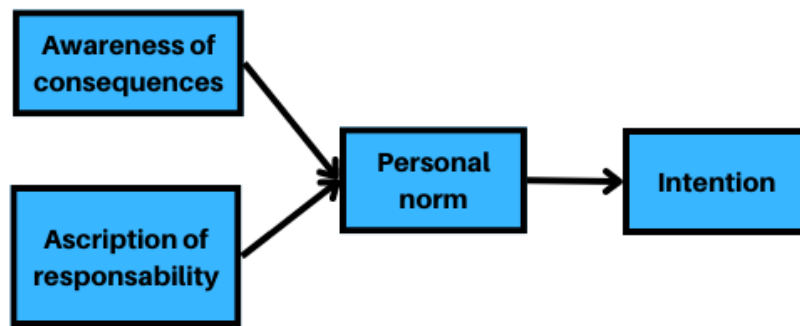
Source: Pierto Lanzini, "Consumer Behavior" Lecture, Ca' Foscari University of Venice, 2021

Value Belief Norm Theory (1999)

Can also be seen as an evolution of the norm activation model, in this case the awareness of consequences is not at the same level of ascription of responsibility but rather an antecedent.

This model states that, and awareness of behaviors depend on the values of the individual, depending on the individual values he can experience different awareness about specific topics and different feeling about personal responsibility. And considers that values are very stable and persistence over time while attitude are variable and can change overtime.

Figure 1.5 Value Belief Norm Theory
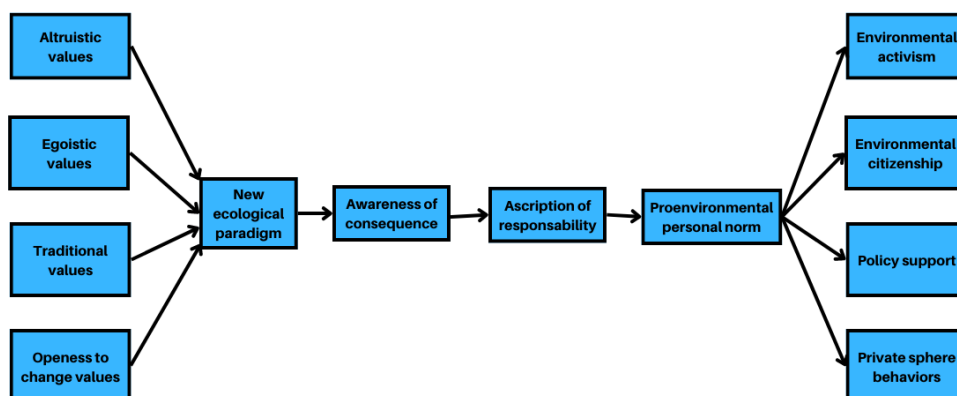
Source: Pierto Lanzini, "Consumer Behavior" Lecture, Ca' Foscari University of Venice, 2021

1.5.2 Automaticity and habits

Rationality is the not only driving force behind our purchasing or behavioral pattern, but also habits play a fundamental role, when we do something over and over, we start doing it automatically without thinking hence in an irrational way.

Habits are repeated behaviors that have become automatic responses in recurrent and stable context, in order to call something a habit three aspects must be satisfy: the frequency of past behavior, stability of the context and automaticity.

Although it seems that habits are efficient since they free mental capacity to do other activities (Verplanken and Orbell, 2003), they could be very problematic, some marketing fields such as unconventional marketing studies suggest empirical test that say that most of the time, we do our purchasing out of habit much more out of rationality. It is difficult to frame an effective marketing campaign making people change their behavioral patterns if this people have deeply rooted habits.
To measure and analyze habits we can use several methods:

The Self-Reported Habit Index (2003)
Implemented by Verplanken and Orbell, this instrument contains twelve items to measures specific habits and behaviors strength by using Likert scales.

Figure 1.6 Self-Reported Habit Index

(Behavior X) is something …

1.   … I do frequently.
2.   … I do automatically.
3.   … I do without having to consciously remember.
4.   … that makes me feel weird if I do not do it.
5.   … I do without thinking.
6.   … would require effort not to do it.
7.   … that belongs to my (daily, weekly, monthly) routine.
8.   … I start doing before I realize I'm doing it.
9.   … I would find hard not to do.
10.   … I have no need to think about doing.
11.   … that's typically 'me'.
12.   … I have been doing for a long time.

Source: Verplanken and Orbell, Reflections on Past Behavior: A Self-Report Index of Habit Strength University of Essex 2003.

This method is about psychological trades of personality that makes subjectively more pro or adverse toward changes.

Between these two methods there is a correlation between them, because if some resist to change (Oreg scale) most likely will be developing habits. (SRHI scale)

The main difference between the self-reported habit index and the Oreg resistance to change scale is that the latter doesn't talk about a specific behavior but has rather a generic predisposition towards change or resisting change in general.

We can conclude that individuals act based on the two factors rationality and automaticity, it of course depending on the specificity of the context one might be more relevant than the other, but both are always taken into consideration. Therefore, there is an integration of rationality and automaticity

Two models that integrate these two ways of thinking are the attitude-behavior-context model (ABC model) and the comprehensive action determinant model (CAD model.)

1.6 Changing consumer behaviors

Habit discontinuity hypothesis

As previously mentioned, habits are repeated behaviors that have been made automated, once a repeated behavior becomes a habit, they are usually very difficult to change. Nevertheless, there are theories to suggest when to implement strategies to try to change habits.

The habit discontinuity hypothesis (HDH) is one of the most important hypotheses to implement strategies to change habits, it suggests that there are some windows of opportunity that open up when there are big disruptions in the way things are done usually and hence, we are more open to consider an alternative.

Because the context changes completely and therefore subconsciously we are more open to reconsider alternatives way of action, and once the individual try to change

and is satisfied with the result, it is very probable that they won't go back to the old habit.

This hypothesis does not tell us which strategy to implement but rather when to implement a communication strategy whenever this window of opportunity opens. A current example of these windows of opportunity is the recent covid pandemic, which itself represents a great window of opportunity for many behaviors (mobility, purchasing, human interaction...)

<u>Self Determination Theory (1985 and 1991)</u>

This theory states than when we do something we have a motivation to do it. In order to change a behavior, we need to consider that the individual must have a motivation (intrinsic or extrinsic) or an incentive (monetary or non-monetary).

There are different types of motivations and incentives, for instance, an intrinsic motivation refers to something because it is enjoyable, intrinsically, while an extrinsic motivation refers to a motivation not because you enjoy but because it leads to a separable positive outcome. Sometimes these motivations go in different way known as crowding out effect and sometimes they could go in the same direction known as crowding in effect.

<u>Interrelated behaviors</u>

A very interesting feature to note is that behaviors are interrelated, what you do in one domain affects what you do in other domains.

This so-called spillover can be both positive, that is, the most sustainable I act in one domain, the more therefore I behave in another domain, or negative, the more I do in one domain the less I do in another domain.

The following theoretical background terms support the idea of spillover effect:

- Self-Perception (positive spillover effect)

Suggest that we use our past behaviors as clues of the future behavior, having a positive spillover. For instance, if the individual does something sustainable

subconsciously would be sustainable from now on.

- Cognitive Dissonance (positive or negative spillover effect)

The individual is sustainable once and since people do not like to feel incoherent or been seen by other as hypocrite, he continues to do it, however, if it's too demanding to act consistently, the individual may become irresponsible in both domains.

- Learning theories (positive spillover effect)

If an individual does something responsible, he will increase his awareness about the overall issue of responsibility of ethical issues and by increasing his awareness he will guide his behaviors in a different context.

- Contribution ethics (negative spillover effect)

Considers the social aspect of the individual, states that acknowledging that sustainability is a very complex situation, and the individual have done my part in one specific domain, then he might think that is up to others to do they part.

- Moral licensing (positive spillover effect)

Acknowledging that sustainability (saving the world) is a very complex thing, (I cannot save the planet by myself) so if I have done my part in one specific domain, then is up to others to do they part.

The most important aspect is the social aspect.

1.7 Investigating consumer behavior

Investigating consumer behavior and obtaining useful and necessary information to achieve objectives can be difficult and complex, since people tend to act differently depending on the context.

Below we explore the different types of data, research, and studies with which we can work when doing consumer research.

Referring to consumer research there are two main types of data that we can work with:

Primary research data involves collecting fresh data, you collect for the first time,

you're the first person to collect that data.

<u>Secondary research data</u>: research method which involves data already being collected by somebody else.

Each of these data implies a series of pros and cons, summarized in table 1.1

Table 1.1 Primary and Secondary Data

	Advantages	**Disadvantages**
Primary data	• Applicable & useable • Accurate & reliable • Up to date	• Expensive • Not always immediately • Not always readily accessible
Secondary data	• Inexpensive • Easy to access • Immediate	• Often outdated • Potentially unreliable • May not be relevant

Source: Pierto Lanzini, "Consumer Behavior" Lecture, Ca' Foscari University of Venice, 2021

The two main types of research are the qualitative and quantitative research, as the name imply
the qualitative usually focus on the quality of the research and the research is usually applied as in-depth interviews or focus group. On the other hand, the quantitative research applies quantitative interviews and experimentation.

The type of study applied can also be divided depending on the time in which they are carried out. If a study deals with one single moment in time is called a cross sectional study and has the goal of picturing of a specific phenomenon in a specific, on the other hand when a study follows the evolution of a specific phenomenon overtime is called a longitudinal study and has the goal of observing and investigate the same sample at different points of time.

Consumer research is said to be valid when it collects the appropriate data, measures what is intended to measure and reliable the results will be the same if the study was performed on another sample representative of the same population.

In the case a study is not reliable, the outcome cannot be generalized, so is not representative of the population I'm interested I'm in, is just representative of the people I interviewed.

1.8 Purchase behavior

The behavior of the purchase by the consumer usually begins with a need that the individual wants to satisfy with a product or service.

The individual goes through 3 phases of variables before reaching the purchase.

1. personal variable: age, gender, occupation, personality, lifestyle...

2. social variables: social role, culture, social class, social pressure...

3. psychological variables: cognitive process, perception, attitude.

Figure 1.7 Purchase Behavior Journey
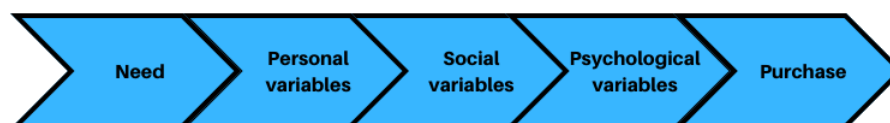
Source: Pierto Lanzini, "Consumer Behavior" Lecture, Ca' Foscari University of Venice, 2021

The Engel-Blackwell-Miniard Model (1993)

Also known as the consumer decision model is structured around a 7 point decision process:

1. Need recognition
2. Search for information

3. Pre-purchase evaluation of alternatives

4. Purchase

5. Consumption

6. Post-consumption evaluation

7. Divestment

In turn, this decision process is influenced by the information process where the individual justly investigates, is exposed to information, and retains the most valuable information in order to satisfy his or her need.

As well as the external and internal variables that affect the decision process, for instance, the external influence of the environment such as family or culture, or the internal one, how the individual's own attitude or motivation influences the consumer's decision.

Figure 1.8: The Engel-Blackwell-Miniard Model
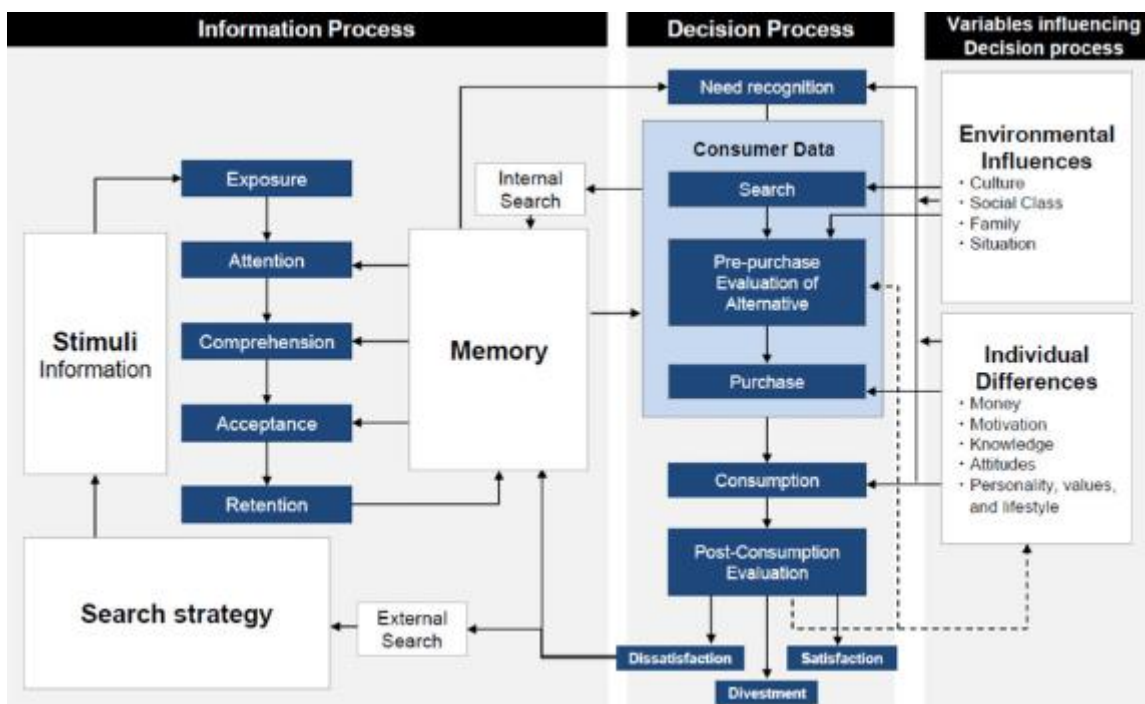
Source: Komatsu, Hidetoshi & Watanabe, Emi & Fukuchi, Mamoru. (2021). Psychiatric Neural Networks and Precision Therapeutics by Machine Learning. Biomedicines. 9. 403.

Customer Satisfaction

The Kano Model (1984)

This model helps us understand the level of consumer satisfaction regarding a product or service, companies tend to produce different types of products and services which under the kano these are perceived as a bundle of attributes, however, companies do not usually know which of these attributes is more relevant for the consumer. In order to solve this issue, the Kano model offer insights on how customer perceive single features of the offer in order to decide where to focus the efforts.

As a basis for the model, Kano proposed using two dimensions that would help us determine how customers feel about certain features of a product or a service.

From consumer behavior theory we know that the consumer seeks to satisfy his need, this was noted by Cano who proposed a dimension that goes from total satisfaction to total dissatisfaction. The second dimension considered by Kano was that of functionality which ranged from nonfunctional at all to the best functionality possible.

The consumer decision journey

The decision-making process have been evolving in time, the initial process used to be more similar to a funnel since in the past it was more complicated to find information about products, however, now thanks to tools like the internet is easier for consumer to have access to a lot of information about almost everything, making the process more circular.

The four main steps on the consumer decision journey are the following:

1) Initial consideration set: the consumer considers just an initial certain set of brands to its exposure to recent touchpoint.

Awareness is till relevant since if the individual does not know a brand, he won't be able to can considerate as an option.

2) Active evaluation: There is an active evaluation where the individual starts considering the brand from past stimulus given by the brand.

Under this framework the consumer can subtract but also start adding new brands because when the consumer searches information new brands are suggested to him.

3) Moment of purchase: consumer select a brand and purchase it.

4) Post purchase experience: This step is one of the most important once since here the customer judges the experience with the purchased good and depending if this experience was satisfactory or not the customer could be involved in a loyalty loop that will make him or her buy from the same brand again.

The purchase of one person can trigger the decision of another person to buy. For instance, a post purchase experience leads to consumer giving back feedback like writing online reviews, this must be analyzed by the company and try to engage their customers the loyalty loop back to the moment of purchase phase.

Figure 1.9: The Consumer Decision Journey
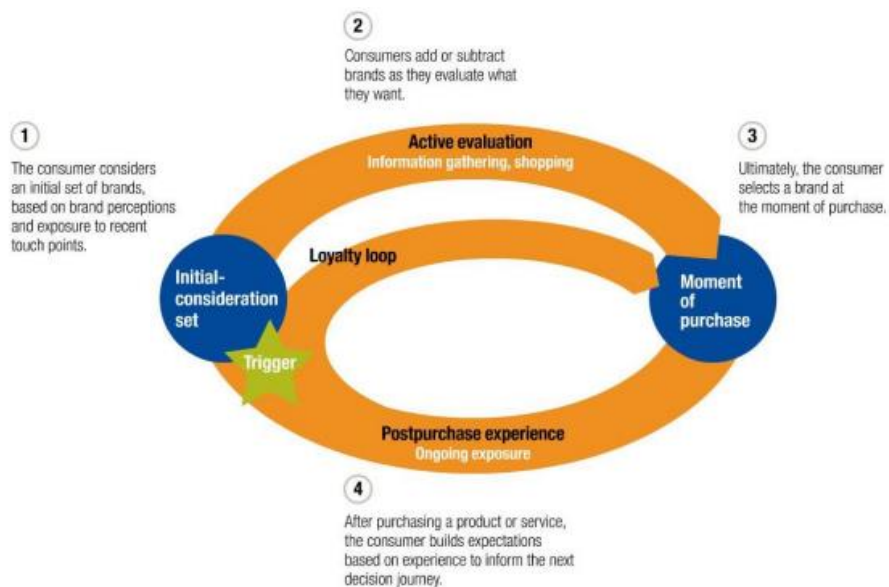
Source: Court, Elzinga, Mulder, Vetvik, The Consumer Decision Journey, McKinsey 2009.

However, there are new theories that challenge this McKinsey theory by proposing models where the consumer is not the one who makes the decisions, but that decision-making power is handled by the brands and new marketing techniques.

Chapter 2: Traditional meat

Historically speaking, animal-based or traditional meat has been one of the main protein sources for human beings, this type of food has been appreciated for its sensory properties such as its unique taste, texture, and nutritional value.

As everything also traditional meat production has been evolving over time, as global population grows also does the demand for meat, through time meat has become more economical and accessible thanks to the advances in technology and intensification of animal farming which have increased cost-efficiency and production volume of meat.

However, animal-based meat has also been accompanied with accidental consequences for human health, natural resources, and animals these consequences are starting concerns between consumers which are now considering meat alternatives.

The need to reduce these negative effects has led researchers and developers of meat substitutes to create new or introduce alternative food products aiming to be attractive to consumers. Nevertheless, this is not an easy task usually struggle to reach their goal of attracting new consumers and therefore increasing meat substitutes consumption since it can be challenging, and it is even more difficult when these innovative alternatives are mean to be a substitute for a product that is highly appreciated and consumed like it is animal-based meat.

Both products offer different kind of benefits and disadvantages and there are many variables that play a significant role when choosing between meat and plant-based meat such as price, taste, culture or even social pressure. Nevertheless, there is a large economic opportunity for meat analogues since having alternatives to meat can be very beneficial as it offers a wider range of products that may be of interest for different segments of the population.

Studies have shown that there is a lack of congruency between people thoughts and their actual actions. For instance, most people perceive meat production methods as morally unjustifiable, however, they have also shown that consumers are not aware of meat consumption impact on environment and constantly tend to underestimate

the higher environmental friendliness of plant-based meat substitutes over traditional meat (Hartman & Siegrist, 2021).

When people were asked about physical attributes such as taste, texture, appearance, and smell, studies show that moderate users of meat alternatives and regular meat consumers rate meat as better than meat alternatives while meat alternatives consumers rate them as better than traditional meat (Hoek et al, 2011).

Overall meat is usually associated with positive words such as "delicious", "food" but above all it is associated with being natural. On the other hand, meat alternatives are usually associated with unfavorable words such as "disgust" (Hartman & Siegrist, 2021).

Studies have also shown the difference association between males and females, as females tend to associate meat with more negative effects meat consumption imply such as environmental effects and animal welfare, men associate meat with more positive aspects such as the proteins and delicious taste of traditional meat.

Meat substitutes are vegetable-based food products that contain proteins from non-animal sources mainly soy, cereal, and some types of fungi. This type of products has been gaining popularity as health-conscious consumers are now seeking for "better for the body and the planet" alternatives, thanks in part to positive contribution from media which have pushed towards.

Plant-based meat offers an alternative to traditional meat shifting towards less meat consumption required and therefore some help to overcome these challenges Unfortunately, meat alternatives such as plant-based meat are still considered to be niche products on most of the markets.

Yet, one of the most popular meat substitutes are the so-called plant-based meat products are progressively moving from niche to mainstream products due to the recent growing popularity from consumers that are now seeing healthier products, in fact they are expected to constantly grow 12% per year and reach 3.5 billion USD by 2026.

However, PBM analogues integration to diet are strongly dependent on price reductions and consumer's acceptability of this type of product and in order to

understand better the consumer's perception and acceptance of plant-base meat we made a comparison between different characteristics of plant-based meat and animal-based meat products including, their history, economics, regulations, nutrition, consumer acceptance, environmental sustainability, and animal welfare.

2.1 Animal-based meat

Animal-based or traditional meat can be defined as the flesh of an animal destined for human consumption as food. This type of food has always been an important component of human diet since it provides essential elements for our body such as protein, fats, vitamins, and minerals.

Historically, the consumption of meat has been important for the human body and human evolution in general (Pereira and Vicente, 2013). Animal-based meat has been the main food to satisfy the consumer's demand for protein we have always sought protein benefits of high biological value and nutrients that this type of food contains. Nowadays, as a result of advances in technology and the intensification of animal agriculture, these types of food are relatively cheap and accessible to the majority of the population in developed and developing countries.

Meat has a great goodness for the human body since it is rich in high biological value proteins like hemoglobin, it also contributes to human organism for the formation of bones, teeth, muscles. If a human does not consume meat in the proper proportion, it is likely to have low hemoglobin causing anemia which can lead to health complications such as kidney disease or liver (León and Carrasco, 2012).

The consequences of not consuming meat in the long-term can produce pathologies in the central nervous system, malnutrition, and anemia. Backed by the above reasons is recommended that humans should consume animal protein according to their weight, height, and age (Normal is 0.8 to 1 gram of daily protein per kilogram of weight)

Despite the above-mentioned benefits of ABM consumption, the traditional process of meat production requires a huge number of natural resources to sustain itself. For instance, the need for farmland leads to deforestation which causes a negative

climate impact. In general, İntensive meat diet and production has been associated with important global and health issues including harmful effects on human health, the environment and animal welfare.

However, these issues might be solved in the future since traditional meat processes and agriculture are in constant development.

2.2 Cultured meat

One of the most interesting proposals for consumers who want to be more ethically and environmentally responsible but who are not willing to stop consuming animal meat could be the so-called cultured or clean meat.

This innovative process of animal meat production is an interesting alternative to traditional meat since there is no need of rearing animals and could help to reduce the negative effects of intensive traditional meat production on the environment.

Produced by using animal cells to create animal meat for human consumption, cultured meat could be seen as a more ethical way of consuming animal meat since it aims to us less animals than the current conventional rearing.

However, this type of meat is still in an early stage of development and although there are some studies on cultured meat, many of the nutritional values as well as the benefits and disadvantages this type of food generate are still unknown.

Chapter 3: Plant-based meat

The concept of plant-based meat (PBM) can be defined as products that encompass taste, texture, and the total or par nutritional aspects of traditional meat (Rubio, N.R., Xiang, & Kaplan, 2020) but being a product composed by a series of plant based sourced materials and it focuses on the production of sustainable products that replicates conventional meat in both nutritional and physical textures.

The main consumers of plant-based meat are usually niches of ethical and health-conscious consumers which in the majority they are vegetarians, vegans and flexitarian. Naturally, it is to be expected that segments of the population that base their diet on plants and vegetables, such as vegans and vegetarians, are large consumers of PBM or other meat analogues, but why other groups of the population are beginning to show interest in this type of food?

Well, in general the development and research of meat alternatives has increased recently, and in particular plant-based meat products have gained a lot of popularity as consumers demand for healthier, sustainable, and eco-friendly products have been growing in the last few decades. This new need from the customers has done that the meat analogues industry became progressively moving from being an entirely niche product to becoming a more mainstream product.

It has been shown that meat eaters would be more willing to try and even switch to plant-based meat substitutes if such products mimic the traditional meat-eating experience in nutritional as well as sensory terms. Precisely for this reason, PBM manufacturing companies and developers have focused on producing products that are as similar as possible to meat.

Currently, we can find a wide variety of PBM products on supermarkets and even in convenience stores, the more common ones being burger patties, nuggets and sausages.

As previously mentioned, plant-based meat has changed overtime, which has led us to be able to divide this concept into 2 categories:

1. <u>Traditional plant-based meat</u>: developed thousands of years ago, including relatively simple plant-derivatives such as soybeans and wheat with the focus of replacing the nutritional values of meat.

Figure 3.1: Traditional plant-based meat products

Tempeh   *Seitan*   *Tofu*

2. <u>Novel plant-based meat</u> are new innovative meat products characterized by the design and marketing to promote them as an equivalent to traditional meat, these new PBM products where not only focused to mimic traditional meat in a nutritional sense but also to recreate its sensorial experience.

Under this category most common and popular products available in this type of category are strips, chunks, patties and burgers, chicken-like blocks, ground beef-like products, nuggets, steaks, sausages, etc.

Figure 3.2: Traditional plant-based meat products

Beef   Nuggets   Burger

Plant-based meat products initially aimed to develop sustainable products that could recreate the proteins offered by traditional meat, that goal was fulfilled long time ago by traditional plant-based meat products like tofu and tempeh.

However, nowadays the companies that produce plant-based meat are focused on satisfying the need of today's consumer to consume a sustainable product that is inspired or seeks to recreate traditional meat not only in nutritional values but in its appearance, smell and taste.

In order to create novel plant-based meat, in addition to using the main plant-based ingredients such as soy, peas, rice or vegetables to obtain protein, the so-called non-protein ingredients are added, this ingredients include fillers, oils, fats and colorants and their purpose is precisely to help the product recreate traditional beef in the most similar way possible. Animal origin.

3.1 Plant-based meat ingredients

Although the concept of PBM has gained popularity in recent years, it is a fact that there is a considerable proportion of the population ignores the existence of it, and although there is a part of the population that is aware of these products, the vast majority do not include them in their day-to-day diet.

Because of this, usually, when someone thinks about plant-based meat they tend to imagine a "bad copy of meat" sort of product that tries to mirror meat but has a lack of flavor and nutrients.

As this might been true time ago, plant-based meat nowadays offers almost an exact equivalent to what is known as traditional meat. Therefore, is key to understand how this novel plant-based meat is produced as well as the ingredient and hance the nutrients it contains.

In order to be an offer attractive product for the consumer, it is important to know the role of each ingredient and the degree of appreciation that the consumer has for each of them. for example, the consumer has a higher willingness to try or to switch to plant-based meat products when they mimic meat both in sensory and texture properties.

In general, a typical meat substitute contains protein, water, flavorings, oils or fats, binding and coloring agents. Many of these ingredients are highly refined, and for this reason the meat analogues tend to face much criticism for being artificial products.

Plant-based meat is mainly composed by plant proteins (20-50%), vegetal lipids (0-5%), polysaccharides (2-30%) and other ingredients such as coloring agents. flavoring and fortification ingredients, these last ones mentioned are added in order to offer a better meat-like experience to the customer.

Plant proteins

There are different ingredients used in the production of plant-based meat products, due to their tech-functional properties (viscosity, solubility...), plant proteins play important roles in the composition of plant-based meat, more specifically they give structure, color, texture, and flavor.

These proteins can derive from many plant sources such as legumes (soy, peas,...) cereals (wheat, rice,...) and some vegetables like the potatoes.

Plant proteins have multiple properties and functionalities which can be used depending to the necessity of the final product, however, protein availability is an important factor that should be considered before the selection of ingredients.

For instance, insufficient cultivation of some crops such as lupin make it impossible to satisfy the market demand, even despite the huge potential and demand for this plant protein the production of PBM with this plant protein is not socio-economically viable to be supplied.

Different types of plant sources of proteins

Most plant-based products are primarily formulated with soy, pea, and wheat protein. However, is important to highlight that depending on the source variety, pre-processing, and purity of the plant protein we can find different functionality, compositional and nutritional values.

More than a half of the total meat analogues products, more specifically 63.3% include soy protein, while 46.8% of meat analogues include wheat protein, 40.2% of meat analogues include pea protein, 7.2% of meat analogues include rice protein and finally just 4.7% of meat analogues include vegetable proteins.

The protein content varies depending on the process to which a certain protein source is subjected, for instance a pure soy concentrate is composed by 20% more

protein than final soy flour, this process directly affects the presence of additional compounds that determine the functional properties of the ingredient.

The most common sources of protein in the manufacture of PBM as shown below, are typically ingredients that can be found on daily food products that omnivores and meat-eaters consume, such as pasta, cookies, bread, soy milk.

Soy protein is considered to be the most used protein since it has high protein content, include many functional properties and economically it is a low-price source of protein.

Soy most important properties include that it contains a balanced amino acid composition and acts as extenders and binders at low price. In addition to this, soy protein has a wide supply availability.

Lately, the popularity of soybeans has been criticized by pro-environmental consumers since this legume is one of most cultivated in the world and its over-cultivation causes environmental problems such as deforestation and degradation of the soil.

Wheat protein is also a widely used ingredient in meat analogues, a characteristic of wheat is that it gives a fibrous texture similar to that of traditional meat and maintain the product together and stable due to its properties such as solubility, viscosity, swelling and water holding capacity.

The most important protein that can be found in wheat is undoubtedly gluten, this protein is a key ingredient for many meat analogue products since it can be used as a binder giving fibrous structures to products.

Gluten can also be found on other sources of protein such as soy, however, since it can be found in high amounts which makes it very attractive since it can be obtained as a by-product of the production of wheat starch, playing an important role as it reduces losses during the cooking process.

Despite the economic advantages of gluten and its functional contributions to PBM products, in recent years, the "gluten free" diet and products have gained popularity since gluten has been related to celiac diseases.

Pea protein has been an important alternative to soy protein that has recently gained popularity as it is highly adaptable, hypoallergenic and has good functionality. It can be highlighted that the protein of the peas improves the nutritional value and gives better physical attributes to the PBM since it can be used as binder and filler.

Legume proteins in general have recently gained popularity for their functional properties such as emulsification, foam stabilization and gel formation

Other non-animal proteins less used but equally important in the production of PBM are rice and potato, the main advantage of these proteins is that they do not contain gluten, this adds them an added value when it comes to targeting consumers who do not consume gluten.

The research and innovation of new protein ingredients are under constant development, among the most outstanding are the proteins of beans, insects, algae, microalgae, and fungi. Of course, each one of them, as in the case of the proteins already used, vary in nutritional values, content, affordability, and environmental impact.

Vegetal lipids

Vegetal lipids make up 0 to 5% of the PBM, they are responsible for replacing animal fat by providing saturated fatty acids, unsaturated fatty acids, and other fat replacers that usually come from vegetable oils which from a nutritional perspective are healthier and more sustainable than animal fats. These fatty acids and fat replacers improve the meat-like flavor, texture, and mouthfeel in the PBM.

There are 3 main different lipids, and according to the source and composition they offer a different meat-like experience.

1. **Lipids rich in saturated fatty acids,** can be sourced for instance on coconut oil and cocoa butter.

2. **Lipids rich in unsaturated fatty acids**, can be found on vegetable oils such as sunflower, canola, sesame, or avocado oil.

3. **Fat replacers**, as the name states it, they can replace characteristic of meat. Fat replacers are found on oleo gels and fibers which due to its properties can be considered as fat-free.

Polysaccharides

Polysaccharides can be found in native starches, flours and fibers and have both functional and structural role of adding consistency and water biding to plant-based meat.

Native starches and flours such as wheat, peas, potatoes, rice, and many more are used as filers to improve texture and consistency of PBM. While fibers due to their water holding capacity through creating stable oil/water emulsions allow thickening and less product to be lost during the cooking process.

And finally, in order to deliver a product more similar to meat and with the purpose of generating a better experience for the consumer the following final ingredients are added:

Flavoring ingredients

Such as sugar, spices, and herbs in order to add even more flavor. They are added with the purpose of imitating the aromatic profile of meat products as well as to hide possible strong odors from vegetable proteins.

Coloring agents

Such as annatto extracts, lycopene, beet juice extract or leghemoglobin to replicate meat color while titanium dioxide is used to mimic chicken color.

In addition to this coloring agent in order to ensure heat stability of these pigments is necessary to add asorbic acid from citrus fruits or apple extracts.

Furthermore, these agents are antimicrobial and preservative which allow the lifetime of the PCM to be prolonged.

<u>Fortification ingredients</u>

Fortification ingredients can be vitamins, minerals and amino acids, these are included to increase the nutritional value of the product. In addition to these, other health beneficial elements that are found in animal products, such as zinc gluconate, cobalamin, among others, are added to replicate the composition of meat products and ensure they provide the same or similar nutrition.

In addition to the health benefits and the higher quality added, some fortification ingredients are especially important for certain types of consumers, such as Vitamin B12, which is a much-needed supplement for vegan consumers.

3.2 Production process

Production of plant-based meat can be summarized into 3 phases:

1) Protein isolation and functionalization ingredients: ingredients such proteins, lipids and polysaccharides are targeted and extracted from plants.

2) Formulation: ingredients are combined, and nutrients are added to match the nutrient profile of traditional meat plant and proteins are mixed with other plant derivative products to develop the desired texture.

3) Texturing: the mixture is reshaped in order to form a meat-like texture.

After considering the first phase of the creation of PBM where we look at the ingredients needed to start producing PBM, we now focus on the second and the final step of PBM production.

As previously mentioned, the flavor and structure of plant-based meat is related to the types of ingredients and processes used in its creation, by selecting different types of ingredients producers are able to tailor made their PBM products.

Formulation and texturing are crucial steps in the preparation process since the consumer expects a product that is almost identical to traditional meat in terms of texture, flavor, smell, and nutritional values.

In the case of the formulation phase, most PBM products are inspired by meat itself, obviously replacing animal-based ingredients with plant-based ingredients that are able to provide the same or similar nutritional value. This second phase is important since it is responsible for ensuring that the product has the appropriate or similar nutritional attributes to those provided by the traditional animal meat. However, the pursuit of replicating animal meat has made PBM producers end up using highly refined or genetically modified (GMO) ingredients, creating a bad image and criticism for being artificial products.

Pressure from health-conscious consumers who tend to pay close attention to the nutritional profile of PBM has forced producers to reduce GMO and highly processed ingredients as the consumer prefers to consume a product that is not an exact replicate of meat but healthy rather than a product that tries to mirror meat in every way and ends up being unhealthy.

There are different technological processes used to texturize protein, such as extrusion, shearing, spinning and freeze alignment, each one of them with different advantages and disadvantages, so depending on the type of animal product we would like to mimic, a specific texturing process is applied in order to mirror the characteristics of such animal product as best as possible.

However, extrusion is considered as the most traditional protein texturing process. The process consists of introducing raw materials into a feed hooper that connects with the extruder machine that is divided into zones where these raw materials are then sheared, cooked/heated, compressed, cooled and finally texture similar to that of traditional meat is obtained.

Extrusion is one of the most used processes because it is efficient and incorporate many benefits such as high productivity, low cost, versatility, and energy efficiency. In addition to these efficient and economical benefits, it also provides benefits related to nutritional value since it enables change in protein conformation such as denaturizing anti-nutritional factors on protein and increasing protein digestibility.

This traditional process was initially established for soy protein however it has been diversifying on a wider range of protein source such as pea and microalgae.

However, this process also has some disadvantages mainly linked to the heating process where high temperatures around 140 to 180 degrees Celsius are used, can lead to color changes, caramelization, hydrolysis, and pigment degradation.

Figure 3.3: Extrusion Machine
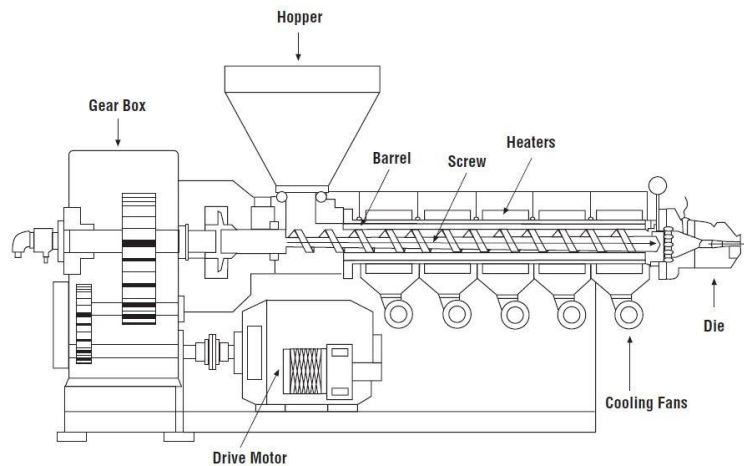
Source: Dr. Harold Giles, An Introduction to Single Screw Extrusion, Dynisco, 2017.

3.3 Regulations

Plant-based meat food are regulated in a similar manner as other non-animal foods, usually controlled by a government institution.

In the United States the Food and Drug Administration (FDA) oversees PBM's safety and in the case of European Union countries, the European Food Safety Authority (EFSA) is in control of overseeing food safety.

In Mexico the Comisión Federal para la Protección contra Riesgos Sanitarios (COFEPRIS) which in coordination with the state health authorities and the Mexican Department of Health is the governmental authority that regulates, controls and promotes the adequate sanitary status of food products is

Nevertheless, most PBM products contain simple ingredients that have been already approved for human consumption, however, depending on local regulation and policies new ingredients may be subject to additional evaluation processes.

3.4 Plant-based meat drivers and barriers

The reasons why a consumer is motivated to consume or buy a product used to be mainly the so-called conventional drivers such as taste, cost, and convenience. However, nowadays, consumers have new necessities that are not so conventional but rather emerging, these drivers are more linked to the awareness and well-being of acquiring or consuming a product, these emerging drivers are health and wellness, safety, environment, animal welfare and familiarity.

As a relatively unfamiliar product in the mind of the modern consumer, PBM suffers from drivers and barriers that consumers themselves have established in order to decide whether to adopt this type of food in their diet or not.

It is necessary to understand consumer's acceptance as this gives us an idea of what the future holds and potential improvements for the future for PBM products.

On a large scale, meat consumption has a negative impact on public health, animal welfare and the environment, but if we analyze it more thoroughly, we can realize that the negative impact triggers a greater number of problems, for instance, excessive livestock farming can lead to causing water depletion, intensifying climate change, and having an impact on biodiversity affecting both human health and animal welfare.

Plant-based meat drivers

In order to better understand the drivers that consumers might experience, we look at previous studies that have shown some key factors that need to be considered since they directly or indirectly influence on consumer's purchasing choice and hence the acceptability of plant-based meat on their diet.

(Apostolidis & McLeay, 2016) article on the consumer acceptance of plant-based meat and traditional meat highlight that the motivations a consumer might experience depend on several factors such as taste, price, familiarity as well as environmental, health and ethical concerns.

Another factor that is very important to consider is demographics such as age, income, education, and geography. It has been shown that motivation can be different depending on the country. (Bryant, Szejda, Parekh,2019)

Is also important to consider the potential benefits or sustainability gains from meat analogues according to the ingredients and the process of a specific PBM and of course the acceptability of the consumers.

Below we stress personal drivers with supportive facts that can drive interest on embracing PBM on the consumer's diet.

1. Price

- PBM diets are more cost effective
- Novel PBM is relatively inexpensive since their key sources of protein inputs are cheap.

2. Environmental benefits

- PBM has a lower environmental impact than traditional meat
- Big potential to reduce greenhouse gas emissions (up to 583 MtCO2e per year)

3. Ethical benefits

- Seeks animal welfare
- Seen as cruel free

4. Health benefits

- Freshness and credence quality attributes
- Contains highly beneficial essential amino acids, low saturated fat, and are cholesterol free
- Reduce risk towards health issues commonly related to traditional meat such as cardiovascular disease, diabetes, high cholesterol, and blood pressure.

In addition to the previous drivers there are external drivers which can encourage the consumer to buy or accept the PBM products such as the campaigns done by

media which promotes a healthy lifestyle and spotlights the healthiness and sustainability of PBM, these promotions can also create social pressure from friends or family which can also significantly influence plant-based meat consumption.

Another external driver can be triggered by the correlation between world population and demand for meat, according to the United Nations the world population is estimated to be 9.8 billion people by 2050 the expected increase on demand for meat will imply important challenges for our planet both in terms of the limitations and difficulties meat production faces.

In order to satisfy this demand for food, meat agriculture would have to increase considerably, implying more sustainability issues for both the animal, humans and of course the planet. Here's where PBM can provide a solution for the need of proteins and other nutrients that we can find on meat.

Since meat analogues are usually associated with "better for you and the planet", PBM substitutes are promoted as healthier sources of protein that offer health benefits.

Another factor that might influence the consumer to choose to switch to PBM products is their ethical awareness toward the environmental and animal welfare issues caused by traditional meat production such as the excessive environmental resource consumption and global warming.

Plant-based meat barriers

Despite consumer's awareness over ethical, health and environmental issues, plant-based meat faces some barriers that keep people from consuming meat alternatives and increase the probability of future consumption, to understand these barriers in a simple manner we look at the three main different sources from which they can arise.

1. **Person related factors**

Consists of personal unwillingness that the consumer may find with the idea of consuming or accepting PBM in their current diet, these issues are generally related to deep-seated eating habits or food choice motives in general, or even due to food neophobia.

Considering that meat analogues products are relatively new, some segments of the population might deal with food neophobia, because people who do not consume PBM tend to have unwillingness to make a dietary change due to unfamiliarity and lower nutritional and sensory appeal.

In addition to food neophobia there are also personal food choice motives an individual might adopt, a clear example of this behavior is that although PBM products have shown to contain nutrients and proteins equivalent to traditional meat many consumers consider meat products as their primary source of iron and protein and hence an indisputable part of their diet.

2. **Product related factors**

This type of factor consists of problems directly related to the product, such as meat's taste and convenience.

Meat offers convenience it is easier to find, for instance in a supermarket or in restaurants it is easier to find traditional meat options than to find PBM products and depending on the type of product meat could be cheaper than PBM.

Contemporary, plant-based meat faces criticism of being an artificial and high-processed product which leads to rejection from potential consumers to start purchasing or accepting PBM on their diet.

3. **External related factors**

There are also external barriers that persuade the consumer to reject the adoption of PBM on their diets such as general unknowledge of PBM and little consciousness

on the adverse effects animal meat production have on health and in the environment due to the lack of media or governmental health institutions diffusion.

There is the consumption of meat as something cultural or even nationalistic, for instance, in some regions of Sweden, meat is perceived as central to nutritional health, when these types of links to meat exist, there is less willingness for the person to change their eating habits.

Furthermore, when there is cultural or emotional attachment to meat, individuals tend to reject different foods and maintain their usual diet, they tend to justify meat consumptions and the negative effects that it might imply considering meat as natural and necessary.

So, despite the significant improvements made overtime on plant-based meat products, food industries still have difficulties in delivering the right sensory experience.

In the future plant-based meat companies and meat substitute companies in general will be able to increase familiarity of PBM products which can lead to the reduction of price and increase of availability of the products. In addition, by improving the taste and nutritional benefits they will be able to deliver a better meat analogue experience.

However, they will require to highlight the drivers and their importance to rise consumer's understanding of environmental, health and ethical issues that meat production imply.

Table 3.1: Extrusion Machine

Plant-based meat drivers and barriers

Drivers		Barriers
Personal drivers		**Personal barriers**
1. Price		1. Adversity to change
2. Environmental		2. Neophobia
3. Ethical		
4. Health		
External drivers	Age, income, gender, education, and geography	**Product barriers**
1. Global social challenges		1. Antipathy towards a product related characteristic
2. Mass media campaigns		
3. Social pressure		**External related**
		1. Lack of diffusion
		2. Socio-cultural pressure

Chapter 4: Plant-based meat industry in the Mexican market

4.1 Mexican Food Market

In order to have a better understanding about plant-based meat relevance in the Mexican market is important to have a general glance on the county's economy and demographics as well as the issues faced and its effects on food consumption in the country.

Mexico is a developing country geographically located on the southern part of the North American Continent with borders with the United State of America on the north and Guatemala and Belize on the south. Currently the country has a population of 130 million habitants, it is one of the 15 biggest countries by economy with a GDP of 1.2 trillion dollars but also by size with an 1.96 million square kilometers territory.

To get a better idea about the food industry on a country is necessary to consider a variety of socio-cultural con governmental policy variables such as food expenditure, prices, preferences

In economics, the demand analysis has always been of interest, however in recent years it has taken a higher importance in developing countries. As many developing countries Mexico suffers from social inequalities which directly affect the access of food that certain groups of the population might have. Hence, food consumption is closely associated with income and since income and substitution effects usually vary on consumer's income class malnutrition is greatest among the poor.

Therefore, as a country that suffer from social inequalities is important to acknowledge the role of government programs and policies and how they affect food consumption on Mexican consumers.

The consumption of meat is an essential aspect in the Mexican diet, from ancient times to the current globalization, there has been a relation between meat consumption and relevant events for the country both in the past and in the future.

Many articles have shown that elements such as price and regional culture highly influence and affect the consumption of traditional meat by Mexican consumers.

However, and also partly due to current modern challenges such as socio-political issues and food globalization, the Mexican consumer has now been influenced by emerging global concerns related to health, the environment and animal welfare, encouraging Mexicans to change their eating habits towards a healthier, more ethical and sustainable diet.

4.2 Mexican cuisine: meat and plant-based meat

The Mexican cuisine has deep-rooted culinary traditions that nowadays co-exist with innovative food products, in fact, is considered to be among the most outstanding in the world and in 2010 it was the first cuisine of a country to be accepted by the UNESCO List of Intangible Cultural Heritage of Humanity.

To understand the relationship of the Mexican consumer with meat, we must go back to the pre-Hispanic period, during this period Mexico's native population such as the Aztecs and the Mayans, followed a diet based mainly on the consumption of roots, fruits and vegetables that, thanks to the privileged weather of the Mexican territory, were abundant. However, there was also a consumption of animal meat during special occasions with socio-cultural and protein purposes.

With the arrival of the Spanish in the 16th century new ingredients and foods were introduced to the Mexican culture including the integration of new types of meat such as beef, sheep, pork and chicken, since then the consumption of meat has remained an essential element. in Mexican cuisine and culture.

More recently, Mexico and its food sector underwent an important change, in 1994 the 3 North American countries (Mexico, USA, Canada) signed the North American Free Trade Agreement (NAFTA). The country went through an important change in the diet of its population thanks to the implementation of this treaty since it introduced new food products and new facilities for the import and export of food with its neighboring countries in the north.

In terms of consumption and production of meat, Mexico is among the first places in the world, the large population of the country creates an equal large demand for animal protein.

The amount and type of meat consumed in the country varies according to the regional states, many studies (INEGI 2019 + another) have revealed that in the northern states of Mexico there is a greater expense and hence consumption of meat compared to the center and south of the country.

The National Institute of Statistics and Geography (INEGI) has also revealed the difference in meat preferences on the country, in the northern states the highest consumption of meat is beef while in the southern states chicken is consumed more, poultry tends to be a cheaper type of meat compared to beef. This difference connected to the socio-economic issues of the country since in the north of the country which has a stronger traditional roots of meat consumption, where meat consumption is an integral part of the identity of the people who have lived there (´Avila, Fernandez, & Gomez, 2004; Bertran, 2010), as well as a better economy that allows the population to consume this type of food more often.

Currently, Mexico is one of the countries that consumes the most meat in the world just behind big economies like China, USA, Russia and Brazil. Mexico is the seventh and eighth largest meat producer of chicken and beef respectively in the world. (FAO 2020)

According to the OECD meat consumption indicator in 2022Mexico is 7th largest meat (beef, veal, pork, poultry and sheep) consumer globally, with almost 1700 thousand tons of meat consumed annually the country represents the 5.75% of the OECD countries and a 2.25% of the world's entire meat consumption. Concerning meat consumption by species Mexico is the 5th, 6th and 7th largest consumer of poultry, pork and beef respectively in the world (OECD 2022)

Although Mexico has not been characterized as a leading country in the innovation of alternatives to meat or in PBM in general, there has been a noticeable interest on in adopting healthier eating habits that usually include plant-based products. Thanks to these new demands of the Mexican market, in recent decades Mexico has become one of the Latin American countries with the largest number of the population that has adopted a plant-based diet (19% being vegetarian, 15% flexitarian and 9% vegan) (Moreno, de la Lama,2022)

Today, meat consumption in the country coexists with different types of diets, between the country's culinary traditions and the westernized or Americanized diet that influences food consumption in the country.

4.3 Mexican Food Policies

Governmental policies have important implications since the cost of nutritional and hence food programs influence on population's food consumption in an unfavorable or beneficent way.

Malnutrition has represented one of the main public health challenges in Mexico, in order to solve this problem Mexico government has implemented several programs and policies oriented to improve the nutrition of vulnerable groups.

One of the most important and determining values on a country's food consumption are precisely the demographic variables, in fact, the Mexican government has used demand studies as the basis for its interventions in the food market. The data collected from Mexican households have allowed the government not only to intervene in the food market but also to target and support groups of malnourished individuals.

The long-standing history of Mexican food policies had included many subsidiaries on basic food products as well as regulations and public investments on education, machinery, and distribution on food products.

 Some of the first and more important governmental policies implemented through Mexican history include:

1) Sistema Alimentario Mexicano (SAM) also known in English as The Mexican Food System implemented on March 1980 during President Lopez Portillo administration (1976-1982)

The Mexican Food System was implemented during a period of time where Mexico was not fully self-independent in term of food, at the time the goals where to become grain self-sufficient by 1982 and completely self-sufficient on all farm products by 1985.

The System implemented a plant to identify the best potential farmable land and a process which was complemented by government distribution facilities and

subsidies established a set of production goals in order to reach certain consumption targets which were defined in terms of nutritional requirements.

SAM was officially terminated in 1982 at the end of Lopez Portillo administration, the new president Miguel De La Madrid and his administration (1982- 1988) argued that SAM was not well planned since it implied a large cost for the Mexican taxpayers to maintain subsidies that were not adequately targeted to reach those who were most in need.

2) After the end of SAM a similar program was implemented, the so called Programa Nacional de Alimentacion (PRONAL) was targeted to the population with the high index of marginalization and had main goal to support production, distribution, consumption of food as well as changing the conditions of food and nutrition.

This program increased minimum wages in comparison to the basic basket, promoted food production, orientation and implemented surveillance programs on nutrition. Even if PRONAL had a better strategy and introduced a better degree of targeting was not enough to be successful, the program still had many issues when food intervention to targeting specific groups meaning adequate food products where not reaching the actual population that needed those specific foods.

Most of the food programs in Mexico continued to have a main focus on helping the most vulnerable population.

4.4 Mexican Consumers perception and acceptance of PBM

The main factors that limit the consumption of meat in Mexico are price, income, taste, customer preference but in particular how is the price of meat related to other food products that might substitute this necessity.

In addition to this, there are demographics factors that influence Mexican consumer directly or indirectly on the consumption of meat products:

- The composition of the family in terms of sex and age of the members.

- The level of education which is related to the way in which spending is distributed according to the type.

- The economic class to which a person or family belongs also determines its way of life and therefore their eating habits (Carosio, 2008)

Price and income are important variables to consider in the Mexican market.

The socioeconomics characteristics reflect displacements in the expenses since its linked to a certain lifecycle, directly impact on the accessibility of the products as well as tastes and preferences. So according to the income received, spending on food purchases is higher or lower in households.

Income is related to the food energy that enters a home, it modifies the structure and proportions of consumption. The higher tha family income is, the lower the percentage of this income is invested in food. (Urrego, 2014)

The number of households where the main economic provider just has one permanent job is low, this means that most Mexican families obtain a variable income consisting of the main fixed income plus the fluctuating income from the informal economy.

In many of the cases and as a result of this fluctuation, the income does not allow access to the purchase of the basic food basket. More than one third of the economically active population in Mexico is not able to acquire the basic needs like the basic food basket, health, and education expenses, even when allocating the total income only for these basic needs.

Purchase power have been affected by the increase in prices registering a cumulative loss of 3.45% from 2012 to 2018.

The price of food basket increased 7.62%, while the daily nominal minimum wage have increase just 3.64%

According to a study carried out by the FAO in 2014, developing countries have per capita meat consumption of less than 10kg, which is considered insufficient and often causes malnutrition, while in most developed countries consumption of meat per capita is usually high.

In addition to income, there are exogeneous factors that influence meat consumption in Mexico, for instance:

- Social class which helps us to segment the market

 we consider that since an individual tends to have similar opportunities, housing, lifestyle as well as usually buying similar product as other individuals of the same social class.

There is a relationship between income level, occupation, and house ownership. Individuals who have a high income tend to have a formal job as well as a home and are characterized by spending up to 30% of their income on food purchases as well as consuming meat more than once a week. (Arana et. al., 2012)

It is important to highlight that the consumption of meat in Mexico is higher in some regions than in others because of their gastronomic culture and traditions of these regions. Mexicans that consume the most meat are concentrated in the northern part of Mexico, this was supported by study carried out in 2012 by Taddei in which the author confirms that the population of northern Mexico is characterized by being large consumers of meat, the consumption of this product is constant both at home and outside the home.

According to the FAO (2014) the constant increase in population and income will generate a greater demand for meat. These factors are supposed to be decisive in increasing meat consumption in general.

The variables that have a greater impact on the price of meat in Mexico are: demand, income and the price of their respective substitutes. (Del Carmen et al. 2015)

On the other hand, consumers with low consumption levels and low- and medium-income level, acquire more economic or also called "popular" cuts with a purchase demand of one or two products per buy , these products are usually bought primarily in the public markets and neighborhood butcher shops. (Cortes et. al. 2012)

Usually, in studies on meat consumption in Mexico, income is considered as an important variable but not how social deprivation affect the consumer. The research (Impacto del ingreso…) uses a new research methodology where they consider

social deprivation as a determining variable of meat consumption. This study also considers the methodology of multidimensional measurement of porverty provided by the National Council for the Evaluation of Social Development Policy (CONEVAL), in order to detect the number of social deficiencies present in the surveyed households, to then perform Student's t tests between the economic groups detected and find out if the consumption of the three types of meat studied (beef, pork and chicken) varies between them. [In simple terms social deprivation indirectly determine meat consumption in Mexico)

According to the economic theory of Engel's law of consumption which shows the relationship between income and a particular good or service expenditure. This theory suggest that as household income increase, the percentage of that income spend on food declines [In simpler terms when you have less money you are assign most of your income to food but as income increases a less percentage is used to buy food as now the individual will increase expenses in other areas like luxury goods or savings.] As food cost increases, the percentage spent by lower-income households is expected to increase.

Although the studies on meat consumption give us a general idea of the variables to consider, to the author's knowledge there is no study that focuses directly on plant-based meat in the Mexican market, for which a clear reference of the Mexican consumer's perception of this type of product as well as the most relevant variables to consider.

4.5 Challenges for health policies: overweight, obesity and diabetes.

Mexico has been experiencing some changes in the diet and physical activity patterns of its population, in recent decades, the country has gone from having malnutrition and related health problems such as stomach parasites and infections to being a country that currently suffers from diabetes and obesity.

This has occurred as the country has experienced a sudden change in its diet over the past decades. Beginning in the 1970's, the diet of Mexican consumers was more exposed to industrial foods such as refined and unhealthy ingredients. An event that had a great impact on the Mexican food sector took place in the 1990's, the North America Free Trade Agreement (NAFTA). This treaty facilitated the import of industrialized foods from the United States of America, further expanding the consumption of this type of food. (Denham & Gladstone, 2020)

This change in diet driven by Mexican foreign policy and globalization was combined with an increasingly sedentary lifestyle which led to an increase in health problems such as obesity, diabetes, heart problems and metabolism, in fact diabetes is the current leading cause of death in the country. (García-Chavez, Castellanos-Gutierrez, Sinclair, Colchero, & Rivera- Dommarco, 2018).

Today the country struggles to fight a high rate of obesity, which means the country have to deal with health policies which directly affect consumption of specific types of products. In addition to representing a great danger to health it also represents a danger in the economy since there are direct and indirect costs related to diabetes and its complications.

Direct costs of diabetes include outpatient, inpatient, drugs, medical insurances, and public health programs resulting in a total of 1,600 million USD (2006). The indirect costs of diabetes include the cost of temporarily and permanently disable patients as well as the cost of mortality. These indirect costs are estimated to be 200 million dollars. (2005)

In Mexico a quarter of the population performs little or no physical activity and more than the majority of the population (63%) is overweight, these two conditions typically lead to obesity that finally ends up as diabetes.

Diabetes is one of the main causes of death in Mexico, according to the World Health Organization in 2016, 14% of the Mexican population (approx. 13 million people) died from diabetes, this percentage has been steady since 2009 thanks to health policies and health campaigns implemented by the country.

Unfortunately, and even with the implementation of policies, guidelines and monitoring made by the Mexican government such as healthy campaigns and action plans against this sickness, many researchers suggest rather than declining the prevalence and mortality of diabetes will continue to rise in the future.

Chapter 5: Plant-based meat previous studies: an overview

There have been previous studies focused on consumer behavior, perception, and acceptance of plant-based meat in both developed and developing countries.

This chapter highlights the studies, which gave inspiration to the author of this thesis. One of them was carried out in a developed country while the other carried out a cross-country investigation on plant-based meat.

A study carried out with n=247 participants in the United Kingdom, focus on investigating motivations consumers may have when buying PBM or traditional meat.

This study revealed that motivations depend on several factors, shown in order of strongest to least motivator: Price (45%), Environmental impact (17%), Taste (15%), Type of meat / organic or vegetarian (16%), Health / Fat content (11%). (Apostolidis & McLeay, 2016)

This confirms the importance of adding information about the properties of the product since it influences the purchase decision.

This study also showed that interest in purchasing PBM also depends on demographic data such as:

Age, since young generations (18-34) preference toward PBM was driven by convenience and environmental impact.

While older generations (45-59) preference was driven by taste and familiarity.

Income, because depending on income people are more or less used to consume meat, low-income countries consume meat in smaller quantities than high-income countries.

Gender, meat is less consumed by woman than by men.

Education female young consumers (18-34) are environmental-conscious consumers. While mature female consumers (>55) are health-conscious consumers. (Apostolidis & McLeay, 2016)

Geography, a cross-country survey between the US, China and India showed that a developed country like the US had motivators to purchase PBM such as appeal, excitement, and low disgust. However, developing countries such as China and India had different motivators to purchase PBM.

In the case of China, the motivators were healthiness, appeal, tastiness, and sustainability, and in the case of India the motivators to purchase PBM were sustainability, excitement, necessity, and goodness. (Bryant C, Szejda K, Parekh N., 2019)

Thanks to this last study we can observe the importance of culture in the consumer.

Chapter 6: The study: Online Survey

The survey is one of the most common tools when it comes to explore and evaluate the behavior, experiences and opinions from the consumer.

During the initial design of the survey, 3 main aspects were taken into account:

1. Clarity: the answers on the survey must be clear to the respondents.

2. Comprehensiveness: the questions and answer options must be comprehensive enough to reasonably cover a complete range of alternatives.

3. Acceptability: the survey must have an appropriate length, the survey should not be too long, it should last on average last between 4 and 5 minutes otherwise we risk to lose the interest of the respondents.

   In order to be acceptable, the survey must not invade the privacy of the respondent, in order to do this the author of the survey gave the option to the respondents to choose the answer "I prefer not to answer".

The study was intended to be cross-sectionary and online, it was specially focused on collecting primary data from the Mexican consumers which were asked to respond an online survey with the aim of providing insights on consumer's perception and acceptance on plant-based meat products on the Mexican market.

Primary research on plant-base resulted to be conducted to random sample of n=201 participants from the Mexican population, the criteria to select these individuals was basic and consisted in that they were Mexican citizens and were willing to answer the survey.

After reviewing the previous requirements, it was concluded that n = 192 where able to qualify as acceptable participants.

The survey involved personal and behavioral questions in different formats, these questions where related to the motivations and preferences of the consumers over meat and PBM consumption with a greater focus on the followings:

- Demographics
- Price of meat and PBM.

- Culture
- (Type of) Diet - Omnivorous, Vegetarian, Vegan…
- Lack or unfamiliarity with the product
- Awareness of the benefits and disadvantages
- Taste
- Sustainability

The goal of the survey

- Is to gather both objective and subjective data in order to get knowledge about consumer's habits and opinions.

- Identify consumer associations to the concept of plant-based meat.

- Get an insight into the perception of plant-based meat in the mentioned country.

Hypothesis:

- Plant based meat demand in Mexico is low and still a niche product typically demanded by high class or specific groups such as vegans/vegetarians.

6.1 Pre-testing

Online survey was previously pre-tested on March 2022 by 6 people (3 young and 3 mature adults) with different demographics within the Mexican market.

The early version of the survey consisted of a single section survey with 25 questions, starting with meat and meat substitutes questions and ending with socio-demographic related questions.

The pre-testing group helped the author of the survey to confirm that the questionnaire complied with the 3 main design aspects of the survey: clarity, comprehensiveness, and acceptability.

Pre-testing results

Mature adults (over 50 years old) answered that:

- Survey overall was simple and understandable.

- Questions were clear.

Main suggestion: the survey should be more inclusive by considering in the answers some parts of the population that were not mentioned before like the LGTBTQI community, divorced, widowed...etc.

Young adults

- Survey was long and therefore boring.

- Questions were confusing and not completely clear.

Main suggestion was to rearrange the survey in order to make it easier, modify some unclear questions and change the order of the questions:

- Move questions related to the socio-demographics at the beginning of the survey.

- Modify questions that seem to imply the respondent have tried plant-based meat

- Clarify what the respondent is asked to do (ex. Fill up the blank)

Considering the comments of the pre-testing respondents, the survey was rearranged, and the unclear questions were modified.

6.2 Survey question formats

This section describes the format of the survey questions. In the survey different types of questions such as close ended questions and open-ended questions were used.

<u>Close-ended questions</u>

The main advantage of using closed questions is that since this format uses a fixed list of answers it facilitates the comparison across groups, however, it must also be taken into account that this type of question can increase carelessness in the respondents when answering and in a certain way forces the respondents to choose an answer that may not be exactly the one they want to give but a similar one.

Close-ended questions use different types of scales, in this survey the following types of scales were used:

- Likert scales

  Are used when we deal with agreement or disagreement within certain statement, these types of scales have the advantage that they are easy to prepare and interpret.

  In order to give the possibility to the respondents to be indifferent in their answers we give an odd number answer option.

- Semantic differential scales

This type of scales includes bipolar adjectives such as expensive, convenient…. As well as being relatively easy to prepare and interpret.

- Behavior intention scales

Measures the intentions or the behaviors, in other words the likelihood a consumer will act in a certain way. This type of scale is also easy to construct and administer

<u>Open-ended question</u>

On the other hand, the open-ended questions ask respondent to directly write a response, this let the author of the survey to be able to track responses that he might not be aware of. The disadvantages of using open questions they are not easy to analyze, this makes them inconvenient for the author of the survey and requires an extra-effort from the respondents.

6.3 Methods: Structure of the survey

The survey was conducted using the online survey platform Google Forms aimed for Mexican market consumers, in addition to this requirement, the criterion of selection of individuals was that they were willing to be interviewed.

With a quota of participation set to n=200, the survey raised a total of n=201 participations, however, surveys from participants with other nationalities as well as empty or incomplete surveys were excluded resulting on 192 complete participant datasets considered for analysis.

The data collection was conducted from April to July 2022 and the data obtained from the complete participants was emptied into a spreadsheet template of EXCEL during August and September 2022.

The online questionnaire included 29 questions grouped into two sections.

The first section of the survey collected information related to demographics such as sex, age, education and income, this section of the survey included 7 multiple choice questions.

Demographic Section

Multiple choice questions

1. Gender
2. Age
3. Nationality
4. Marital status
5. Household income
6. Occupational Status
7. Level of education

The second section of the survey included 22 questions: 20 Likert scale questions, 2 multiple choice questions and 2 open complementary questions. 4

These questions related to respondent's diet, dietary habits, meat and plant-based meats. This section allowed the collection of data regarding consumer habits, tastes and preferences.

Studies have shown that the results you get from an empirical investigation depend on how you frame a question and if we personal prompt or not, as a consequence we planned the following questions in order to be the most effective and gather the most information as possible.

Dietary Section

Likert scale question

1. Personally, how often do you buy food?

Multiple choice question

2. How would you define your diet?

Likert scale questions

3. How often do you consume meat products?
4. How familiar is the concept of plant-based meat?
5. Have you ever tried plant-based meat?
6. (If your answer to question 5 was no...) Would you be willing to taste plant-based meat?

Open question

6A. If your answer to question 6 was no... why not?

Likert scale questions

7. (If your answer to question 5 was yes...) What is your opinion on the following properties of plant-based meat?

    7a. Flavor

    7b. Image

    7c. Price

7A. How often do you consume plant-based meat?

7B. How similar is the "experience" (taste, texture, image, etc.) of eating plant-based meat?

8. Complete the "...." on the following sentences.

    "...." he idea of eating plant-based meat

    I have a "...." attitude towards plant-based meat substitutes.

    The choice of buying plant-based meat "...."

    For me, buying plant-based meat will be "...."

9. In the future, I will buy plant-based meat
10. I would consider buying plant-based meat if I saw it on a supermarket.
11. Mi family expect me to buy plant-based meat
12. Mi friends expect me to buy plant-based meat

13. I like to do the same old things instead of trying new and different ones.

14. When I am informed of a change of plans, I get a little tense.

15. Sometimes I find myself avoiding changes that I know will be good for me.

16. I constantly change my mind.

17. Buying traditional meat is something:

    I do automatically

    It would make me feel weird if I did not do it.

    It's a typical thing I would do

18. Buying plant-based meat is something:

    I do automatically

    It would make me feel weird if I did not do it.

    It's a typical thing I would do

19. When choosing which food products to buy, I believe it is also my duty to consider the environmental and social consequences of this choice.

20. Regardless of what others do, I feel morally obligated to minimize the negative impact of my purchasing choices on the environment.

21. Please indicate how relevant the following benefits of a plant-based diet are.

    Environmental protection (water use, land use, etc.)

    Animal protection

    Health problems

Open question

    Other (please specify)

Multiple choice question

22. How much more would you be willing to pay to buy plant-based meat instead of traditional meat?

The questionnaire covers topics from demographic characteristics to the consumption of meat and meat substitutes and the respective attitudes and beliefs towards them, as well as the characteristics desired in both products.

Thanks to the information collected by the questionnaires, it was possible to observe the consumer behavior and habits as well as the perception and acceptability of plant-meat in Mexico.

Chapter 7: Results

In the following section, the questions of each of the two sections of the survey are shown, as well as an overview of the answers given by the population of the survey is given and complemented with the highlights of the most important information gathered from the population's answers.

The participation on the survey resulted in N= 201 participants from which only N=192 participants successfully met the requirements to consider their survey valid.

From these results we expect to achieve one of the thesis main objectives which is to observe how the segmentation on the market and discover the association Mexican people have towards meat and plant-based meat as an alternative of meat.

7.1 Demographic Section

The first section of the survey focused on the demographic data of the population, such data is important to characterize the respondents and be able to identify the different profile segmentation of the population.

The demographic section consisted in 7 multiple choice questions related to gender, age, nationality, income, as well as marital, educational, and occupational status of the population.

Meat consumption in Mexico is related on socio-demographic and economic factors such as cultural differences, traditions, lifestyle, and the influence of current globalization on the Mexican diet, therefore it is important to understand the demographics of the Mexican consumer.

The results of the demographic section allowed us to identify these characteristics of the respondent, showing that the vast majority of the participants in the survey were single young adults, mostly female, with university education and with an average income of $11,000 MXN per month.

Gender

From the sample of N=192, 151 respondents where females, 37 where males and a small portion of 4 participants preferred not to answer if they were males or females.

We can highlight the high participation of females on the survey with 79% and n=151 were females while males' participation was 19% and n= 37.

In addition, the small portion of the participants preferred not to answer if they were males or females represented just a 4% of the total participation on the survey.

Table 7.1: Gender

Gender	Frequency	Percentage
Male	37	19.3%
Female	151	78.6%
I prefer not to answer	4	2.1%

Source: Jose Tonatiuh Delgado Cardenas, Plant-based meat survey 2022

Graph 7.1: Gender percentage
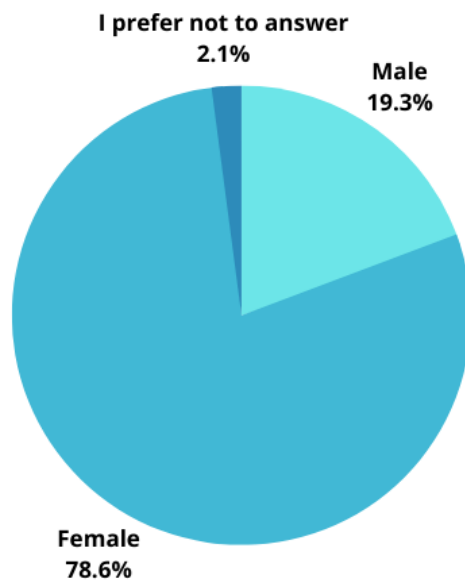
Source: Jose Tonatiuh Delgado Cardenas, Plant-based meat survey 2022

Age

From the answers obtained about the age of the respondents, we can highlight the high participation of young adults between 18 and 27 years of age. In fact,

adolescents and young adults represented 61% of the respondents.

Although, this result was expected considering that the average age of the Mexican population is 29 years old, it is important to take this into consideration as even though mature adults and the elderly may benefit more from PBM products, we can presume from the results of the survey that young adults tend to be more open-minded and hence a higher willingness on trying new products.

On the other hand, mature adults from 28 to 57 years old represented a 29% of the respondents, while elderly adults over 58 years old represented just a 10% of the respondents.

Table 7.2: Age

Age	Frequency	Percentage
< 18	20	10.4%
18 - 27	98	51%
28 - 37	19	9.9%
38 - 47	9	4.7%
48 - 57	26	13.5%
> 58	20	10.4%

Source: Jose Tonatiuh Delgado Cardenas, Plant-based meat survey 2022

Graph 7.2: Age percentage
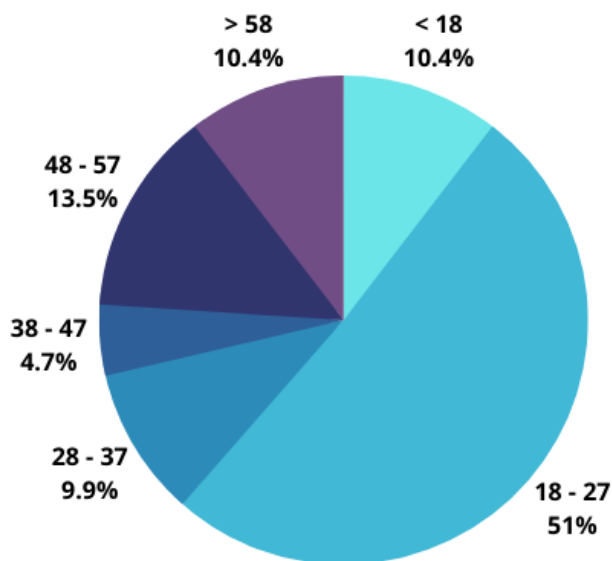
Source: Jose Tonatiuh Delgado Cardenas, Plant-based meat survey 2022

Graph 7.2.1: Respondents sex and age
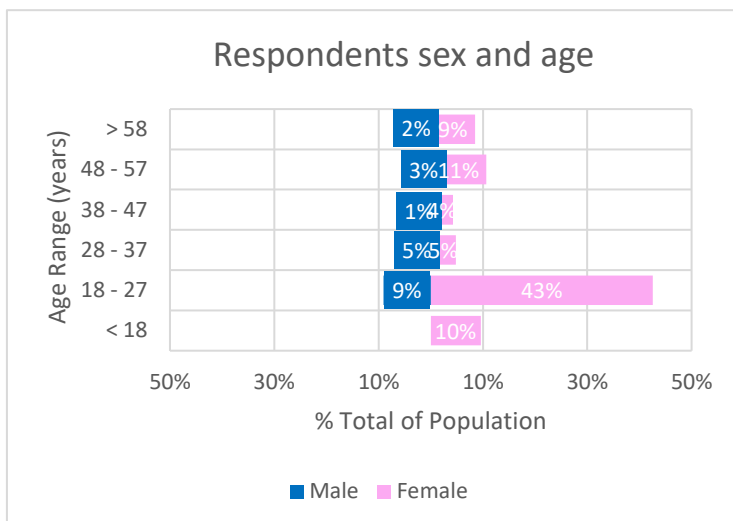
Source: Jose Tonatiuh Delgado Cardenas, Plant-based meat survey 2022

Marital status

More than half (56%) of the respondents declared to be single, this result was to be expected since, as mentioned before, the majority of the participants were young adults.

An important proportion (24%) of the population also declared to be married and 30% declared to be in a relationship.

A smaller proportion of the population (3%) declared to be divorced, a participant declared to be widower and just 1 participant preferred not to answer this question.

Table 7.3: Marital status

Marital Status	Frequency	Percentage
Married	46	24%
Divorced	6	3.1%
In a relationship	30	15.6%
I prefer not to answer	1	0.5%
Single	108	56.3%
Widower	1	0.5%

Source: Jose Tonatiuh Delgado Cardenas, Plant-based meat survey 2022

Graph 7.3: Marital status percentage
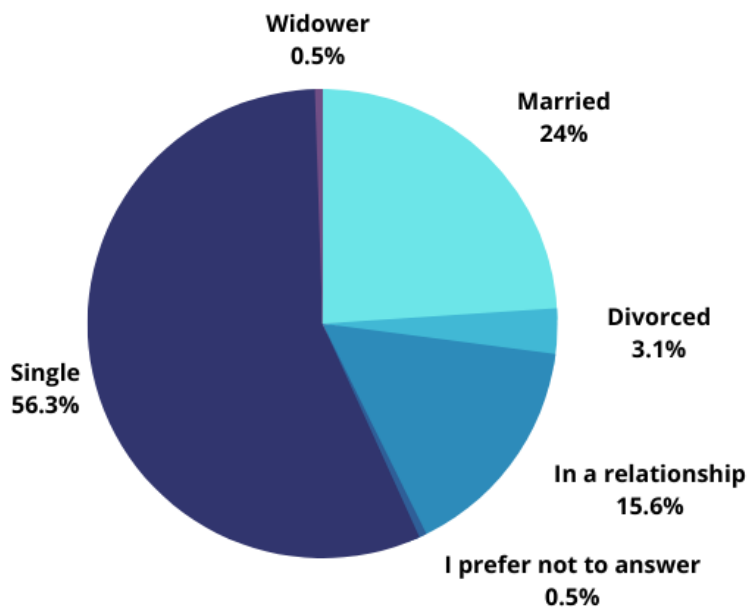
Source: Jose Tonatiuh Delgado Cardenas, Plant-based meat survey 2022

Household income

Family income allows us to know the purchasing power of the respondents, and hence explore if this is correlated with their dietary purchasing decisions. For this question we consider an average income per family in Mexico of 11,000 MXN (INEGI, 2021)

Previous studies have shown that the level of income is related to the food spending and in particular with meat consumption (COMECARNE,2020). The lower the family income, the higher percentage allocation of their monthly salary intended for food purchases, while families with higher income tend to allocate a lower percentage of their monthly salary to food.

Families with lower income levels tend to have a lower likelihood of eating meat, as well as a lower purchase frequency and food portion size. (Frank, Jaacks, Batis, Vanderlee, & Taillie, 2021; Huerta-Sanabria, Arana-Coronado, Sagarnaga-Villegas, Matus-Gardea, & Brambila-Paz, 2018).

We highlight that almost half (48%) of the respondents earn an average income, while 28% percent earn an significant above average income. On the other hand,

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only 18% of the respondents consider that they earn significantly below the average (6%).

Table 7.4: Household income

How would you rate your family income, compared to the national median monthly income (MXN$ 11,000)?	Frequency	Percentage
Below average	34	17.7%
Significantly below average	11	5.7%
Average	93	48.4%
Significantly above average	54	28.1%

Source: Jose Tonatiuh Delgado Cardenas, Plant-based meat survey 2022

Graph 7.4: Household income percentage
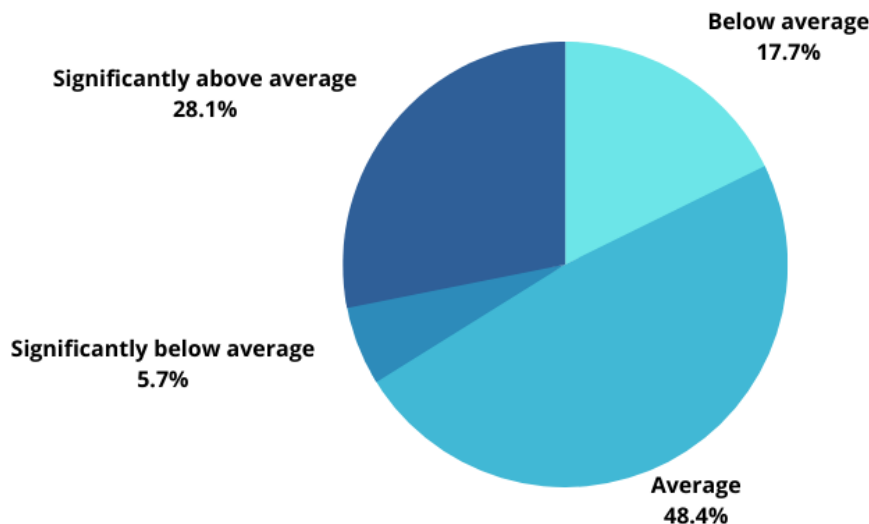
Source: Jose Tonatiuh Delgado Cardenas, Plant-based meat survey 2022

Occupational Status

The majority of those surveyed are students (39%), dependent workers (29%) and autonomous workers (15%).

Small groups of respondents declared to be retired 9% and homemakers (4%). While minimal participation was obtained from the other categories such as unemployed, employee, government employee and teacher.

Table 7.5: Occupational status

Occupational status	Respondents	Percentage
Homemaker	7	3.6%
Unemployed	2	1%
Employee	2	1%
Government employee	1	0.5%
Businesswomen	1	0.5%
Student	75	39%
Retired	17	9%
Teacher	1	0.5%
I prefer not to answer	2	1%
Autonomous worker	28	14.5%
Dependent worker	56	29.1%

Source: Jose Tonatiuh Delgado Cardenas, Plant-based meat survey 2022

Graph 7.5: Occupational status frequency
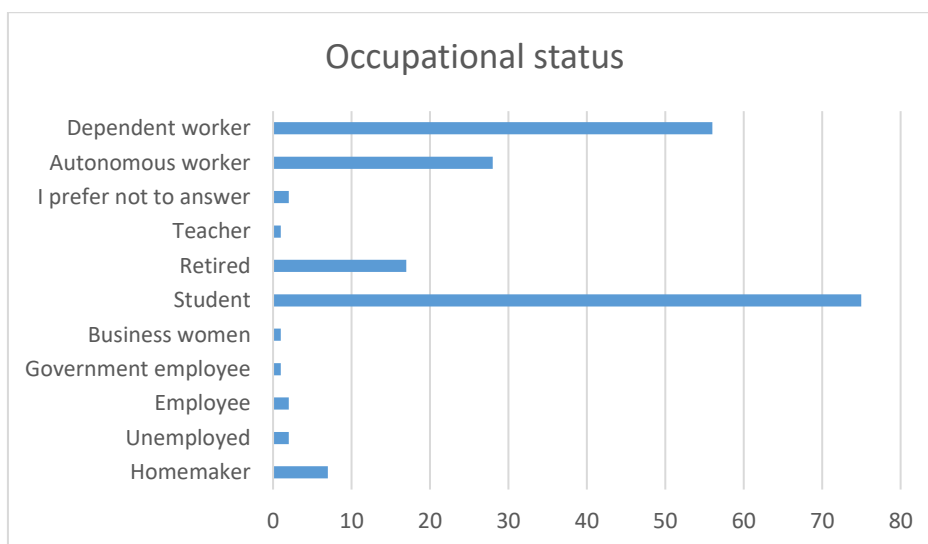
Source: Jose Tonatiuh Delgado Cardenas, Plant-based meat survey 2022

Level of education

Is an important variable since it gives us a look at the level of education of individuals.

Results show that the respondents have a high level of education, the majority of the respondents (65.6%) have at least a bachelor's degree while 17.2% declared to have a masters' degree (14.6%) or a PHD (2.6%).

On the other hand, 13.5% of the respondents declared to have high school education and 1.5% declared to have done just the basic education: primary education (0.5%)

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and middle education (1%)

There is a relationship between the level of education and PBM drivers such as environmental, ethical and economical concern.

We predict that the higher the educational level and thus higher their environmental, ethical and economical concerns the higher the possibility they will be willing try or to adopt PBM on their meat.

Table 7.6: Educational level

Level of education	Frequency	Percentage
University student	1	0.5%
PHD	5	2.6%
Specialty	1	0.5%
Bachelor's degree	126	65.6%
Master's degree	28	14.6%
Primary education	1	0.5%
High school	26	13.5%
Secretariat	1	0.5%
Middle school	2	1%
Technical school	1	0.5%

Source: Jose Tonatiuh Delgado Cardenas, Plant-based meat survey 2022

Graph 7.6: Level of education percentage
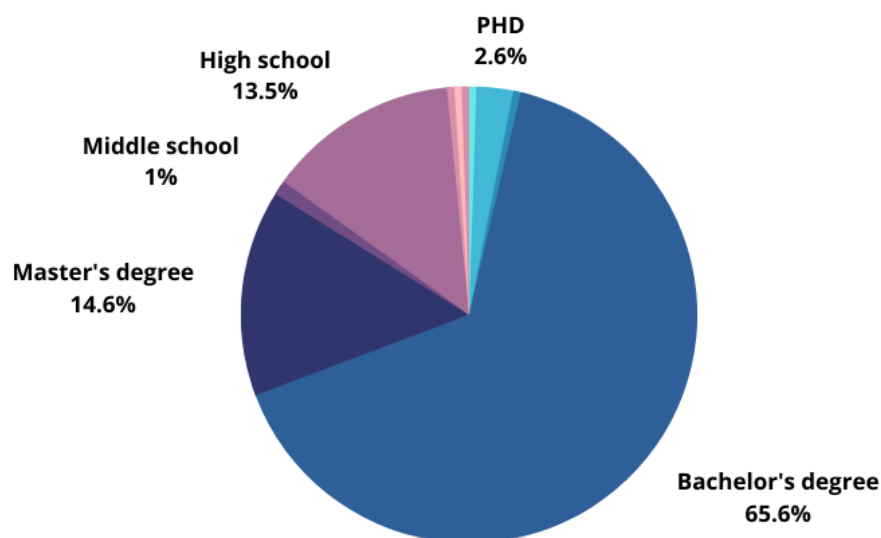
Source: Jose Tonatiuh Delgado Cardenas, Plant-based meat survey 2022

7.2 Dietary Section

The dietary was the second section of the survey, it focused on the eating habits of the respondents, paying particular attention on the respondent's meat and plant-based meat consumption.

To study the answers in this section, multiple choice questions, an open sub-question, as well as Likert scale questions were used, which allow us to explore the behaviors of the respondents.

In most of the questions it was observed that the respondents adopt a neutral or indecisive position without defining a clear preference.

The answers obtained in this section allowed the collection of data from the Mexican consumers related to their consumer dietary habits and food preferences.

1. How often do you buy food by yourself?

Respondents did not show a clear trend on whether they personally buy their food or not. This could be due to the fact that most of the participants were young adults who often still live or depend directly or indirectly on their parents or other relatives and therefore sharing the responsibility of buying their own food with them.

However, it can be noted that overall, there is a slightly higher preference (30.9%) for buying their own food and therefore personally choosing their food consumption.

Table 7.7: How often do you buy food by yourself?

	Frequency	%
Never	40	20.9%
Ever	25	13.1%
Sometimes	42	22%
Often	25	13.1%
Always	59	30.9%

Source: Jose Tonatiuh Delgado Cardenas, Plant-based meat survey 2022

Graph 7.7: How often do you buy food by yourself? percentage

How often do you buy food by yourself?
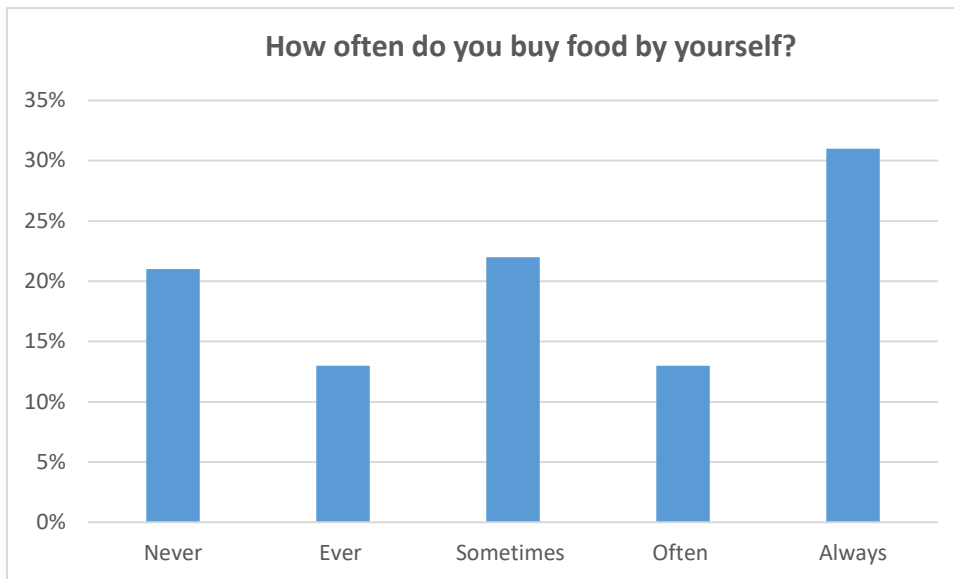
Source: Jose Tonatiuh Delgado Cardenas, Plant-based meat survey 2022

2. How would you define your diet?

In a multiple-choice question, respondents were asked how they would define their diet where they could choose between 5 different answers: omnivore, vegetarian, pescatarian, flexitarian and vegan.

The vast majority of those surveyed (85.5%) follow an omnivorous diet, that is, they consume both animal and vegetable foods.

Only a 9.3% of those surveyed said they follow a Flexitarian diet, that is, they consume mostly vegetable products, however occasionally they tend to consume traditional meat as well as other types of animal products.

Diets such as the vegetarian and pescatarian ones obtained a minimal response in terms of participation, where only 2.1% and 2.6% respectively of those surveyed said they follow any of these diets.

On the other hand, from the n=193 respondents, only 1 defined him/herself as a vegan representing a 0.5%.

This result offered an important insight on Mexicans diet which makes us suggest that, as expected, meat-based products in Mexico are a niche product little consumed by the population in general.

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Table 7.8: How would you define your diet?

	Frequency	Percentage
Omnivorous (Both animal and vegetable foods)	165	85.5%
Vegetarian (Plant-based foods not excluding animal origin products)	4	2.1%
Pescatarian (Fish, seafood and some vegetables)	5	2.6%
Flexitarian (Mostly vegetarian but occasionally meat and animal products)	18	9.3%
Vegan (Only plant-based foods)	1	0.5%

Source: Jose Tonatiuh Delgado Cardenas, Plant-based meat survey 2022

Graph 7.8: How would you define your diet? percentage
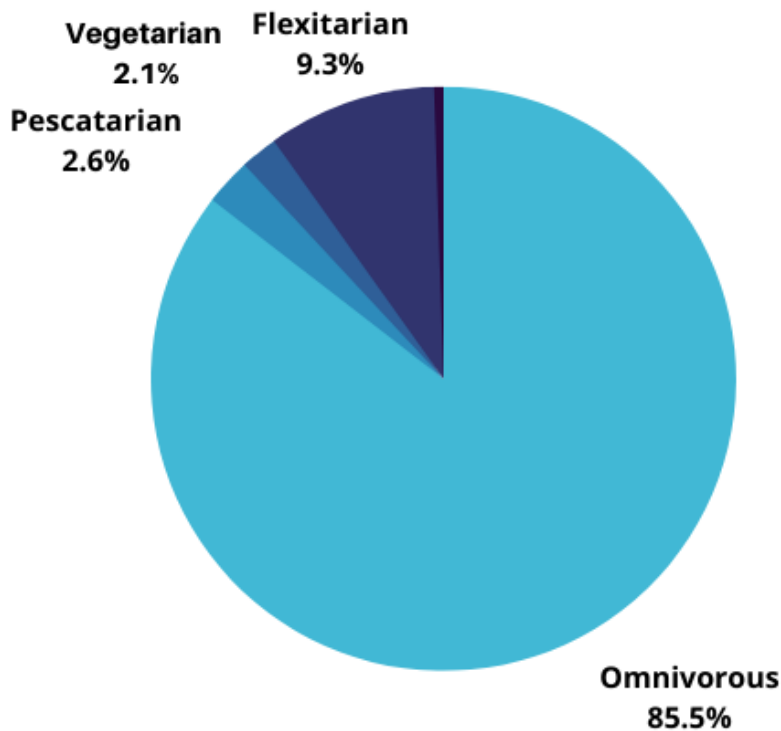
Source: Jose Tonatiuh Delgado Cardenas, Plant-based meat survey 2022

3. How often do you consume meat products?

The majority of Mexican consumers consider that they consume meat products regularly or almost every day, however they do not consider that they consume them every day.

The results of the survey show that there is indeed a demand for meat by the Mexican consumer, the responses of the respondents coincide with surveys previously carried out by the National Institute of Statistics and Geography (INEGI) who showed that 50% of adolescents (<19 years) and 64% of young adults (>20 years old) consume meat at least once a week.

On the other hand, it is important to mention that practically no participant (2%) considered that they never consumed meat products.

Table 7.9: How often do you consume meat products?

	Frequency	Percentage
Never	4	2.1%
Ever	35	18.2%
Sometimes	72	37.5%
Often	57	29.7%
Every day	24	12.5%

Source: Jose Tonatiuh Delgado Cardenas, Plant-based meat survey 2022

Graph 7.9: How often do you consume meat products? frequency
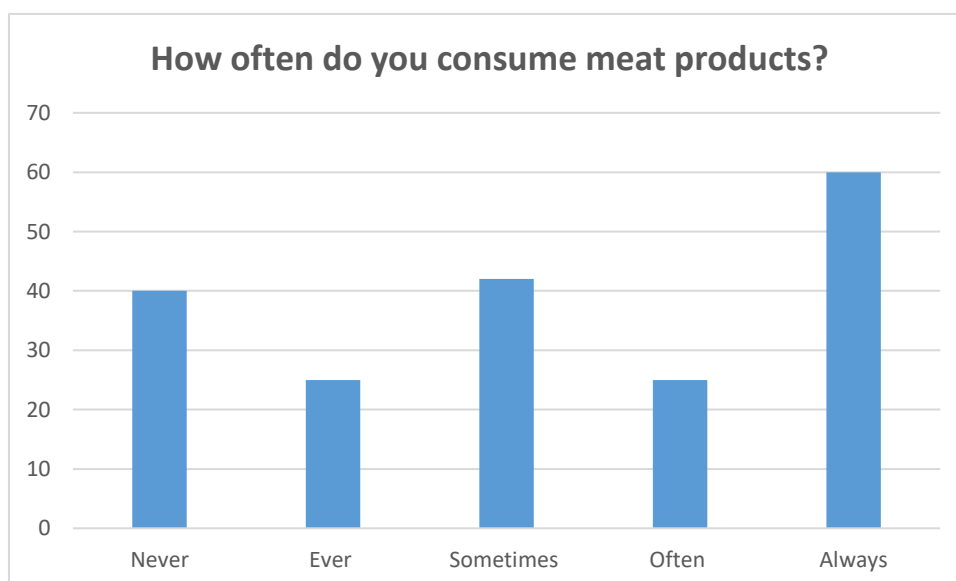
Source: Jose Tonatiuh Delgado Cardenas, Plant-based meat survey 2022

4. How familiar is the concept of plant-based meat?

The vast majority of those surveyed (69.8%) are unaware of the concept of plant-based meat, and specifically, half of those surveyed (49%) have never heard of the concept of PBM.

On the other hand, just 7.3% of those surveyed have heard about the concept of PBM and only 7.3% of those surveyed know the concept very well.

With these results we can confirm that the Mexican consumer is unaware of plant-based products.

Table 7.10 How familiar is the concept of plant-based meat?

	Frequency	Percentage
Not know at all	94	49%
Not so well	40	20.8%
Somewhat well	30	15.6%
Very well	14	7.3%
Extremely well	14	7.3%

Source: Jose Tonatiuh Delgado Cardenas, Plant-based meat survey 2022

Graph 7.10: How familiar is the concept of plant-based meat? frequency
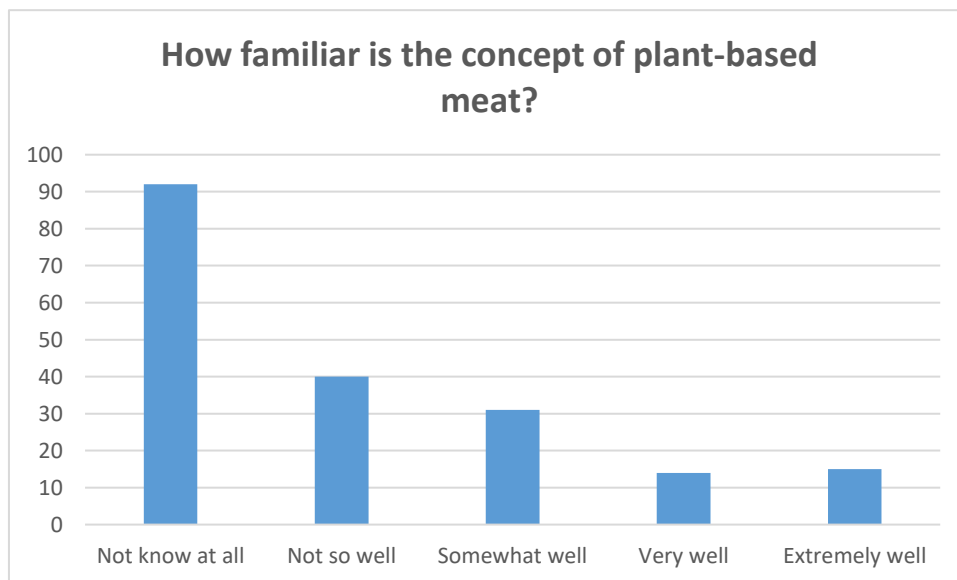
Source: Jose Tonatiuh Delgado Cardenas, Plant-based meat survey 2022

5. Have you ever tried plant-based meat?

77% percent of respondents said they have never tried plant-based meat while 23% of respondents said they have tried plant-based meat.

Table 7.11: Have you ever tried plant-based meat?

	Frequency	Percentage
Yes	45	23%
No	147	77%

Source: Jose Tonatiuh Delgado Cardenas, Plant-based meat survey 2022

Graph 7.11: Have you ever tried plant-based meat? percentage
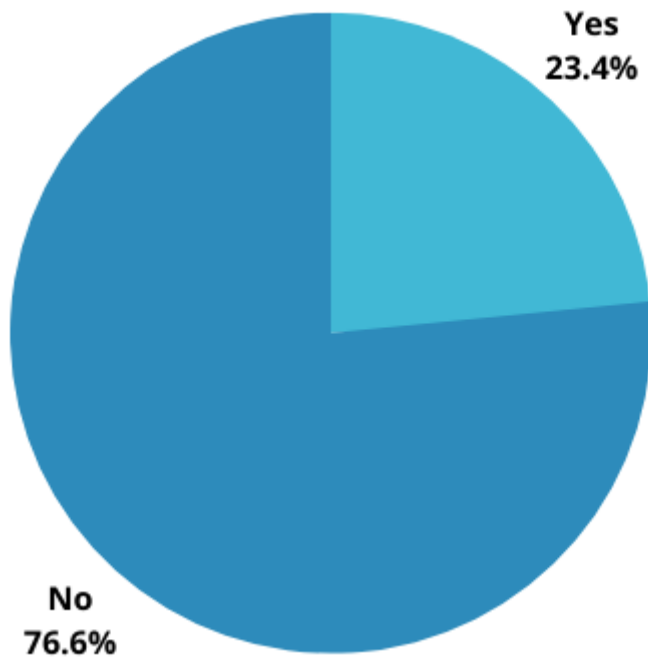
Source: Jose Tonatiuh Delgado Cardenas, Plant-based meat survey 2022

6. (If your answer to question 5 was no…) Would you be willing to taste plant-based meat?

This question was requested only to the sample of n=147 individuals who have answered "No" to question 5 and hence never tried plant-based meat.

Even when the majority of the respondents have never tried PBM, question 6 confirms that 91% of the n=147 respondents who are not aware of the PBM concept would be willing to try it.

Table 7.12: Would you be willing to taste plant-based meat?

	Frequency	Percentage
Yes	134	91%
No	13	9%

Source: Jose Tonatiuh Delgado Cardenas, Plant-based meat survey 2022

Graph 7.12: Would you be willing to taste plant-based meat? percentage
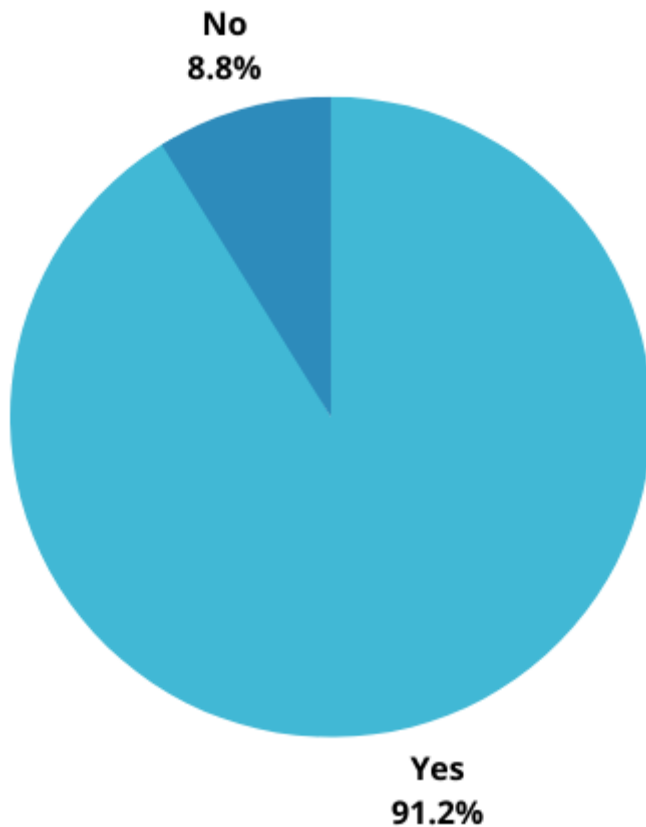
Source: Jose Tonatiuh Delgado Cardenas, Plant-based meat survey 2022

6A. If your answer to question 6 was no... why not?

This open question let the respondent to answer with complete freedom providing us with more detailed information on why the previous 13 individuals from the

n=147 sample of the population that has never tried plant-based meat and would not be willing to try PBM.

The minority of the participants (n=13) who answered that they would not be willing to try plant-based meat answered that they would not because: they do not consider it to be "real" meat or a good substitute of traditional meat, they do not know where to buy it, they do not like to experiment or change their eating habits.

7. (If your answer to question 5 was yes...) What is your opinion on the following properties of plant-based meat?

Question 7 and its sub-sections (7a, 7b, 7c, 7A and 7B) were applied only to the 45 respondents who answered "yes" to question 5 and therefore declared that they have tried plant-based meat.

Of these 45 participants, 40 of them answered questions 7a, 7b and 7c, while 41 respondents answered questions 7A and 7B.

Below are the subsections of question 7 with their respective tables highlighting the percentages of the results.

7a. Flavor

Table 7.13: Opinion on plant-based meat - flavor

	Frequency	Percentage
Worst	0	0%
Bad	4	9%
Average	18	40%
Good	17	38%
Best	6	13%

Source: Jose Tonatiuh Delgado Cardenas, Plant-based meat survey 2022

7b. Image

Table 7.13.1: Opinion on plant-based meat - image

	Frequency	Percentage
Worst	1	2%
Bad	3	7%
Average	14	31%
Good	18	40%
Best	9	20%

Source: Jose Tonatiuh Delgado Cardenas, Plant-based meat survey 2022

7c. Price

Table 7.13.2: Opinion on plant-based meat -price

	Frequency	Percentage
Worst	2	4%
Bad	11	24%
Average	16	36%
Good	9	20%
Best	7	16%

Source: Jose Tonatiuh Delgado Cardenas, Plant-based meat survey 2022

Below a summary of subsections 7a, b, and c of question 7 is shown.

We can highlight that the respondents who have tried plant-based meat consider that in general PBM has a good to average properties in terms of taste, image and price.

However, thanks to these results we can identify an area for improvement since even if the majority of respondents consider that the PBM price is average, there is a significant number of respondents (22%) who consider that the price of PBM is not good.

Table 7.13.3: Opinion on plant-based meat -taste, image and price percentage

	Taste	Image	Price
Worst	0%	2%	4%
Bad	9%	7%	24%
Average	40%	31%	36%
Good	38%	40%	20%
Best	13%	20%	16%

Source: Jose Tonatiuh Delgado Cardenas, Plant-based meat survey 2022

Graph 7.13: plant-based meat properties percentage

Source: Jose Tonatiuh Delgado Cardenas, Plant-based meat survey 2022

7A. How often do you consume plant-based meat?

From the answers we can highlight that none of the respondents who have tried plant-based meat consume it on a daily basis, rather, most of them (46%) consume plant-based meat in rare occasions.

Even though the respondents have previously stated that they had tried plant-based meat, 32% of those surveyed answered that they "never" consume plant-based meat, referring to the fact that despite having tried the product, they have not integrated it into their diets. your diet even occasionally.

Table 7.14: How often do you consume plant-based meat?

	Frequency	Percentage
Never	13	29%
Rarely	21	47%
Sometimes	9	20%
Very often	2	4%
Always	0	0%

Source: Jose Tonatiuh Delgado Cardenas, Plant-based meat survey 2022

Graph 7.14: How often do you consume plant-based meat?
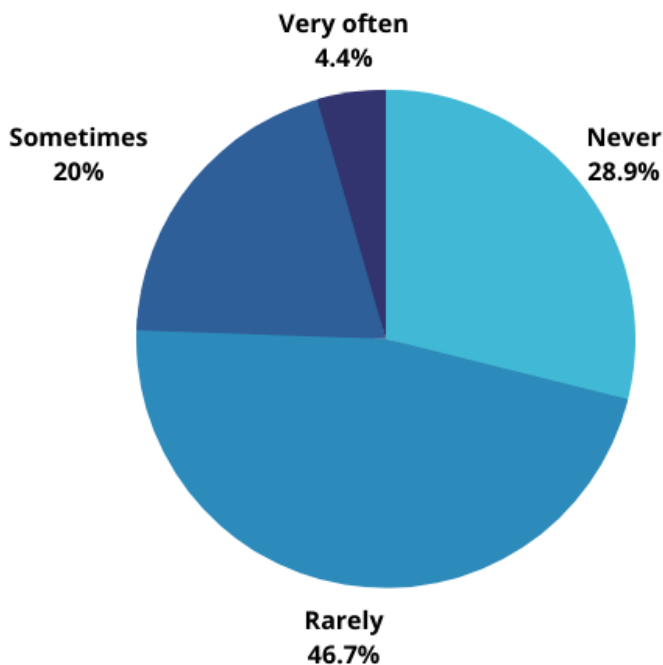
Source: Jose Tonatiuh Delgado Cardenas, Plant-based meat survey 2022

7B. How similar is the "experience" (taste, texture, image, etc.) of eating plant-based meat?

Regarding the experience of plant-based meat, the results show that respondents tend to rate the experience as average to barely different from the experience of consuming traditional meat.

These results evidence and show us another area of improvement for PBM, there is still a need to improve the properties that help PBM to replicate the experience of traditional meat (which is usually preferred by the consumer).

Table 7.15: How similar is the "experience of eating plant-based meat?

	Frequency	Percentage
Completely different	7	15%
Barely different	12	27%
Average	16	36%
Similar	7	15%
Identical	3	7%

Source: Jose Tonatiuh Delgado Cardenas, Plant-based meat survey 2022

Graph 7.15: How similar is the "experience" of eating plant-based meat?
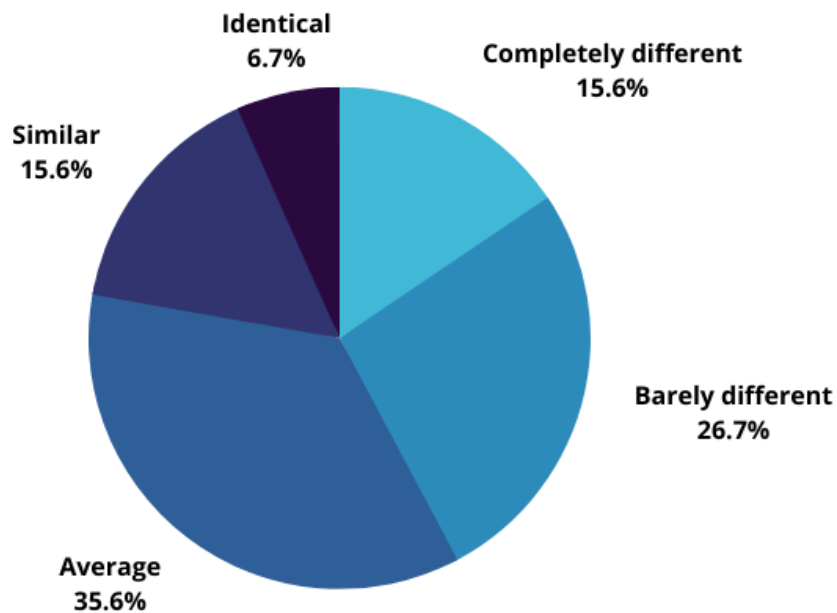
Source: Jose Tonatiuh Delgado Cardenas, Plant-based meat survey 2022

8.   Complete the "…." on the following sentences.

This question consisted of the respondents completing the sentence according to the response options on a Likert scale.

"…." the idea of eating plant-based meat

In general, respondents tended to like the idea of eating plant-based meat rather than dislike it. And 38% of those surveyed showed that they have a neutral opinion on the idea of eating plant-based meat.

Table 7.16: "…." the idea of eating plant-based meat

	Frequency	Percentage
Dislike	11	6%
Somewhat dislike	24	13%
Neither like nor dislike	72	38%
Somewhat like	48	25%
Strongly like	37	19%

Source: Jose Tonatiuh Delgado Cardenas, Plant-based meat survey 2022

Graph 7.16: "…." the idea of eating plant-based meat
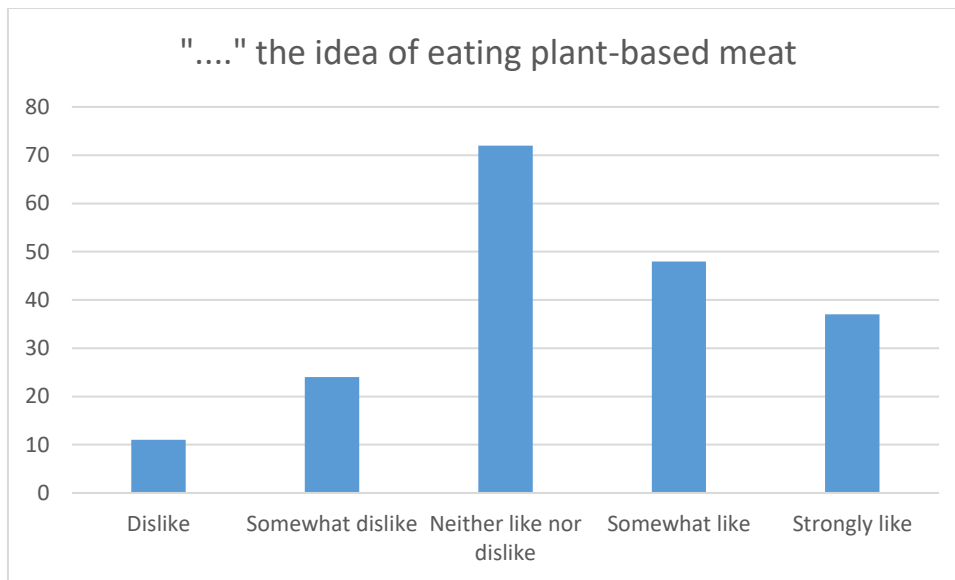
Source: Jose Tonatiuh Delgado Cardenas, Plant-based meat survey 2022

I have a "...." attitude towards plant-based meat substitutes.

Most of the respondents (43%) tend to have a neither positive nor negative trend, while 41% tend to have a somewhat or very favorable opinion towards plant-based meat substitutes.

On the other hand, 14% and 2% of respondents have a somewhat and very unfavorable attitude, respectively, towards plant-based meat substitutes.

Table 7.17: I have a "...." attitude towards plant-based meat substitutes.

	Frequency	Percentage
Very unfavorable	4	2%
Somewhat unfavorable	26	14%
Neither favorable nor unfavorable	82	43%
Somewhat favorable	43	22%
Very favorable	37	19%

Source: Jose Tonatiuh Delgado Cardenas, Plant-based meat survey 2022

Graph 7.17: I have a "...." attitude towards plant-based meat substitutes.
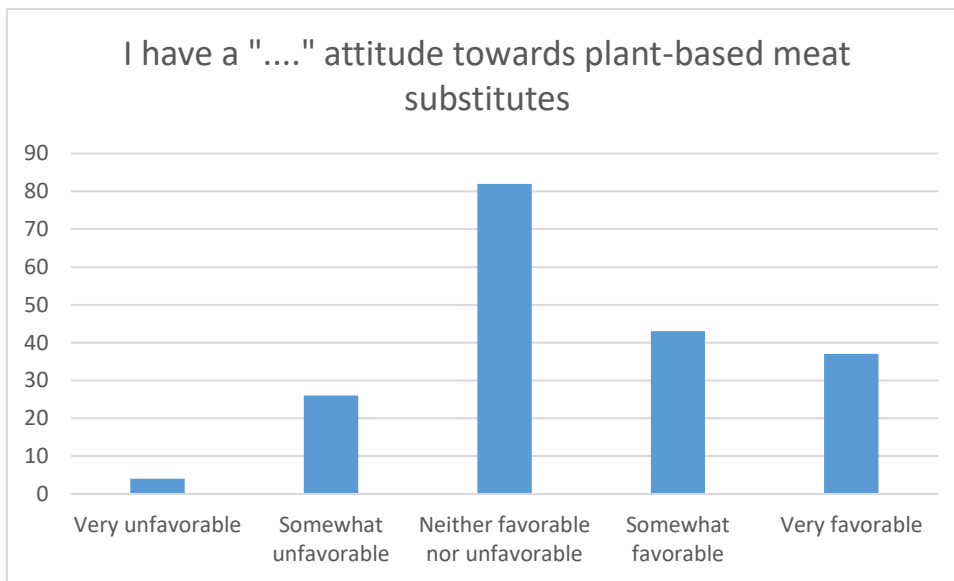
Source: Jose Tonatiuh Delgado Cardenas, Plant-based meat survey 2022

The choice of buying plant-based meat "...."

There is no clear trend in whether or not the choice of buying plant-based meat is up to the respondent.

Table 7.18: The choice of buying plant-based meat "...."

	Frequency	Percentage
Does not depend on me	21	11%
Almost does not depend on me	29	15%
Neither depend or does not depend on me	58	30%
Almost depends on me	40	21%
Depends on me	44	23%

Source: Jose Tonatiuh Delgado Cardenas, Plant-based meat survey 2022

Graph 7.18: The choice of buying plant-based meat "...."
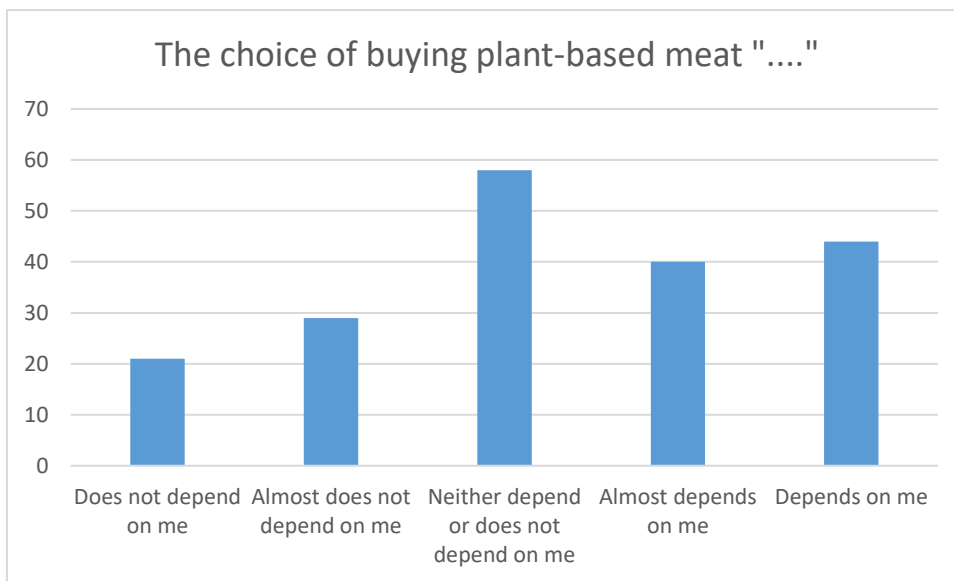
Source: Jose Tonatiuh Delgado Cardenas, Plant-based meat survey 2022

For me, buying plant-based meat will be "…."

We can observe that most of the respondents responded that it is neither easy nor difficult to find plant-based meat. Yet there is an equal proportion (27%) of respondents who find buying plant-based meat easy or difficult.

Table 7.19: For me, buying plant-based meat will be "…."

	Frequency	Percentage
Very difficult	14	7%
Difficult	39	20%
Neutral	87	45%
Easy	37	19%
Very easy	15	8%

Source: Jose Tonatiuh Delgado Cardenas, Plant-based meat survey 2022

Graph 7.18: For me, buying plant-based meat will be "…."
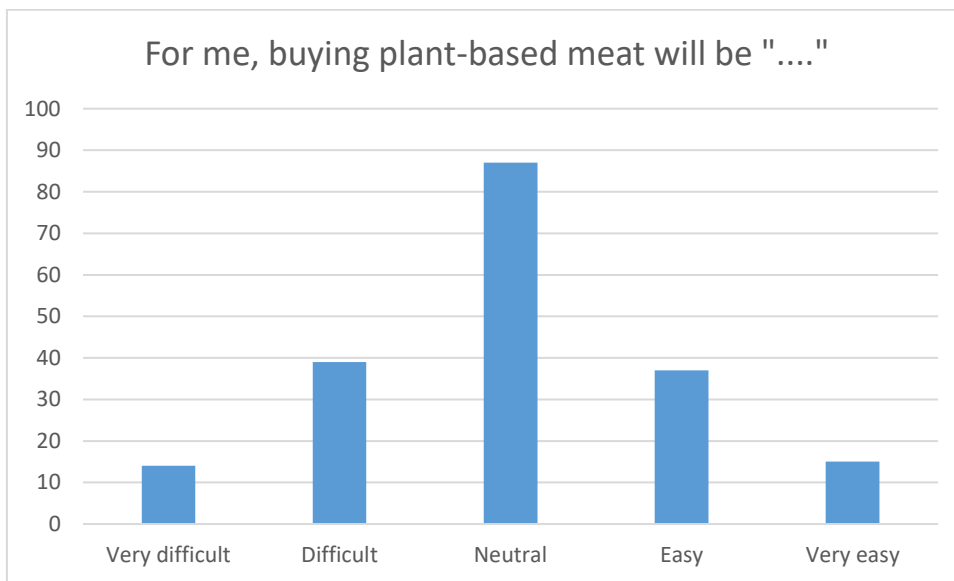
Source: Jose Tonatiuh Delgado Cardenas, Plant-based meat survey 2022

9.   In the future, I will buy plant-based meat.

Many of the respondents (40%) were hesitant when asked if they would buy plant-based meat in the future. However, we can observe a greater tendency towards agree and strongly agree to buy these types of products in the future than disagree or strongly disagree?

Table 7.20: In the future, I will buy plant-based meat.

	Frequency	Percentage
Strongly Disagree	8	21%
Disagree	21	11%
Undecided	77	40%
Agree	45	24%
Strongly Agree	41	21%

Source: Jose Tonatiuh Delgado Cardenas, Plant-based meat survey 2022

Graph 7.20: In the future, I will buy plant-based meat.
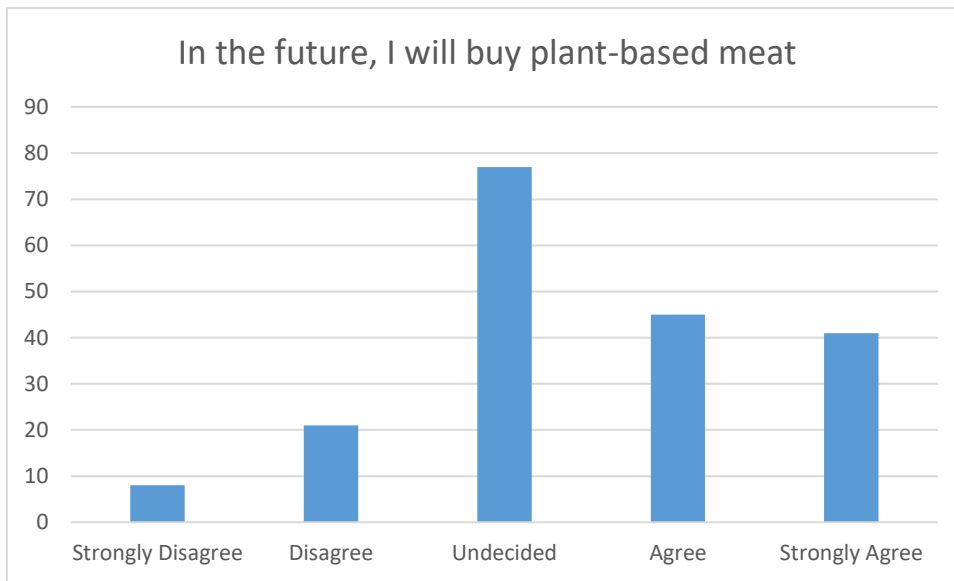
Source: Jose Tonatiuh Delgado Cardenas, Plant-based meat survey 2022

10.   I would consider buying plant-based meat if I saw it on a supermarket.

The results of the question showed that 29% of those surveyed remain undecided when considering buying plant-based meat when they find it in a supermarket.

However, as in the previous question, there is also a greater preference towards buying it than not buying it when they see it in the supermarket.

Table 7.21: I would consider buying plant-based meat if I saw it on a supermarket.

	Frequency	Percentage
Strongly Disagree	9	5%
Disagree	27	14%
Undecided	56	29%
Agree	56	29%
Strongly Agree	44	23%

Source: Jose Tonatiuh Delgado Cardenas, Plant-based meat survey 2022

Graph 7.21: I would consider buying plant-based meat if I saw it on a supermarket.
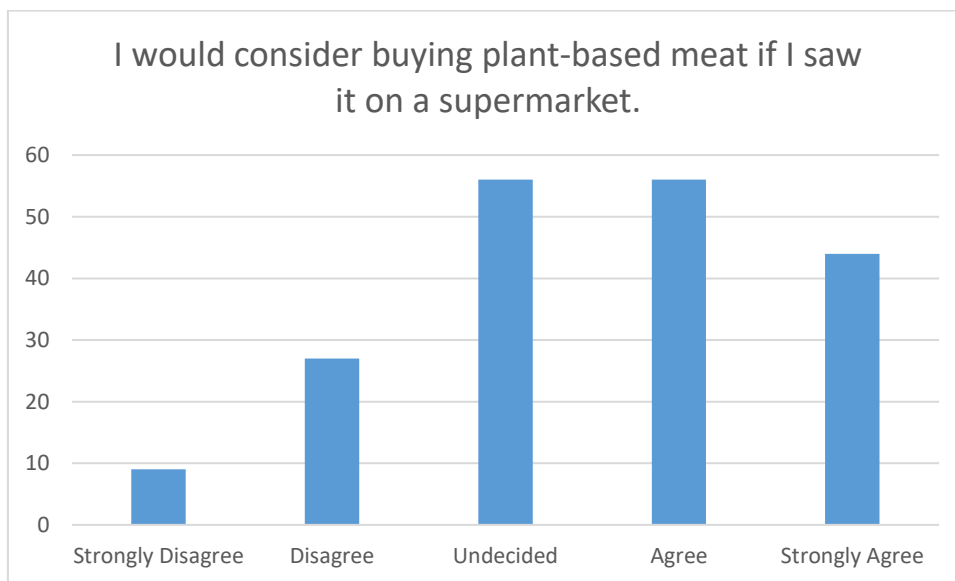
Source: Jose Tonatiuh Delgado Cardenas, Plant-based meat survey 2022

11.   My family expect me to buy plant-based meat.

The majority of respondents (52%) do not feel pressure from their family members to buy plant-based meat.

A significant proportion (34%) are not sure if they feel pressure from their family or not, while 14% admit to feeling some kind of pressure from their relatives to buy plant-based meat, more specifically 10 % feel pressured and 4% feel strong pressure from their family.

Table 7.22: My family expect me to buy plant-based meat.

	Frequency	Percentage
Strongly Disagree	66	34%
Disagree	35	18%
Undecided	65	34%
Agree	19	10%
Strongly Agree	7	4%

Source: Jose Tonatiuh Delgado Cardenas, Plant-based meat survey 2022

Graph 7.22: My family expect me to buy plant-based meat.
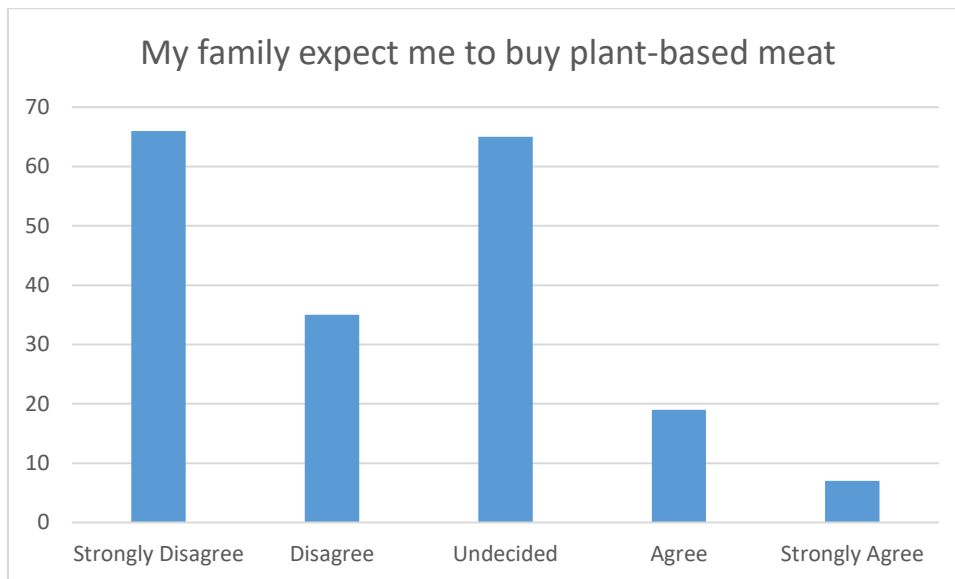
Source: Jose Tonatiuh Delgado Cardenas, Plant-based meat survey 2022

12. My friends expect me to buy plant-based meat.

The majority of respondents (53%) do not feel pressure from their friends to buy plant-based meat.

However, 36% are not sure if they feel pressure from their friends or not.

Only 11% admit to feeling some kind of pressure from their friends to buy plant-based meat, more specifically 8% of those surveyed feel pressured and 3% feel strong pressure from their friends

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Table 7.23: My friends expect me to buy plant-based meat.

	Frequency	Percentage
Strongly Disagree	61	32%
Disagree	41	21%
Undecided	69	36%
Agree	16	8%
Strongly Agree	5	3%

Source: Jose Tonatiuh Delgado Cardenas, Plant-based meat survey 2022

Graph 7.23: My friends expect me to buy plant-based meat.
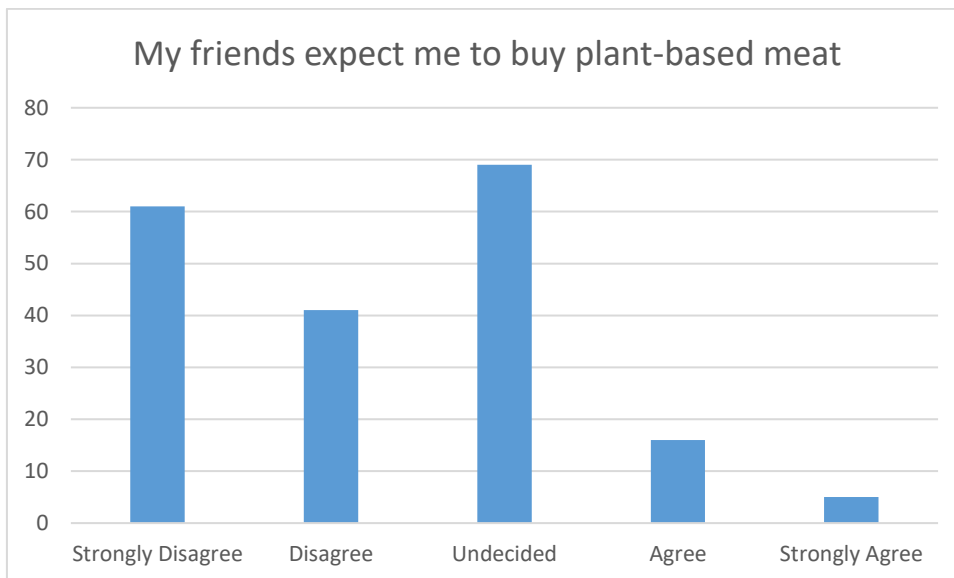
Source: Jose Tonatiuh Delgado Cardenas, Plant-based meat survey 2022

13. I like to do the same old things instead of trying new and different ones.

This question helps us to better understand the behavior of the respondents, we can emphasize that 39% of the respondents are not sure if they like to try new things or not.

We can observe that there are slightly more open-minded participants (28%) who do not agree that they like to do the same things always compared to the 23% of respondents who agree that they like to follow their routine.

Table 7.24: I like to do the same old things instead of trying new and different ones.

	Frequency	Percentage
Strongly Disagree	32	17%
Disagree	40	21%
Undecided	75	39%
Agree	27	14%
Strongly Agree	18	9%

Source: Jose Tonatiuh Delgado Cardenas, Plant-based meat survey 2022

Graph 7. 24: I like to do the same old things instead of trying new and different ones.
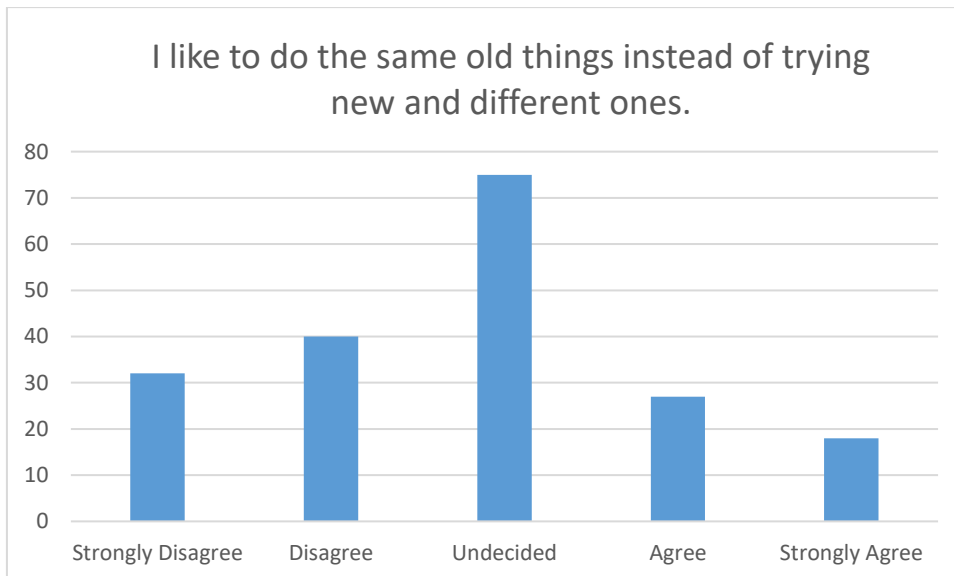
Source: Jose Tonatiuh Delgado Cardenas, Plant-based meat survey 2022

14. When I am informed of a change of plans, I get a little tense.

Respondents were hesitant to answer if they tense up when there is a change of plans.

We can see that 35% of the participants disagree or strongly disagree, while 29% declared that they were in favor or strongly in favor of becoming a little tense when informed of a change in plans.

Table 7.25: When I am informed of a change of plans, I get a little tense.

	Frequency	Percentage
Strongly Disagree	20	11%
Disagree	46	24%
Undecided	69	36%
Agree	43	22%
Strongly Agree	14	7%

Source: Jose Tonatiuh Delgado Cardenas, Plant-based meat survey 2022

Graph 7.25: When I am informed of a change of plans, I get a little tense.
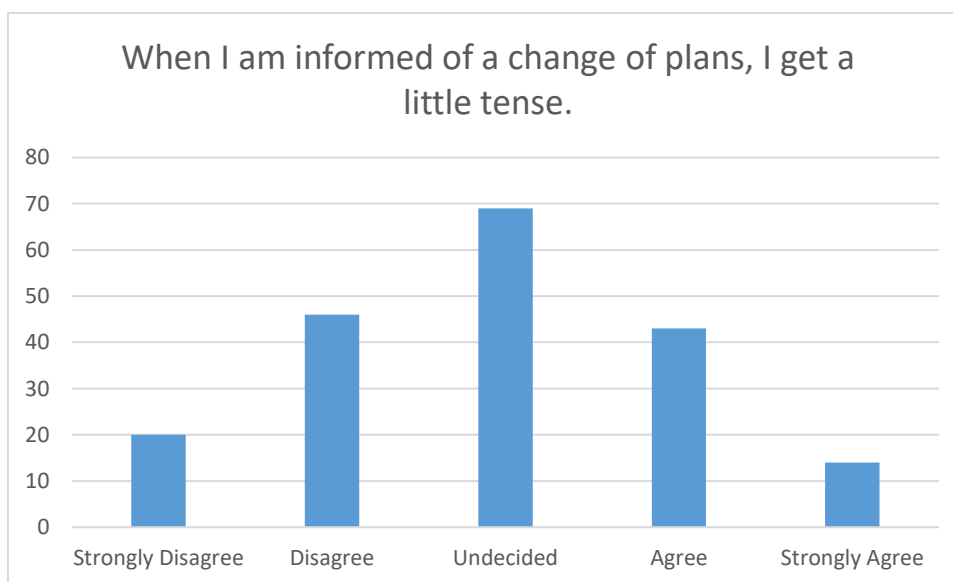
Source: Jose Tonatiuh Delgado Cardenas, Plant-based meat survey 2022

15. Sometimes I find myself avoiding changes that I know will be good for me.

Regarding whether the participant tends to avoid changes even knowing that they are good for him or her, 35% of those surveyed remained undecided while 24% agreed and 31% agreed to avoid changes even knowing that they would be good for them.

Table 7.26: Sometimes I find myself avoiding changes that I know will be good for me.

	Frequency	Percentage
Strongly Disagree	28	15%
Disagree	37	19%
Undecided	68	35%
Agree	45	24%
Strongly Agree	14	7%

Source: Jose Tonatiuh Delgado Cardenas, Plant-based meat survey 2022

Graph 7.26: Sometimes I find myself avoiding changes that I know will be good for me.
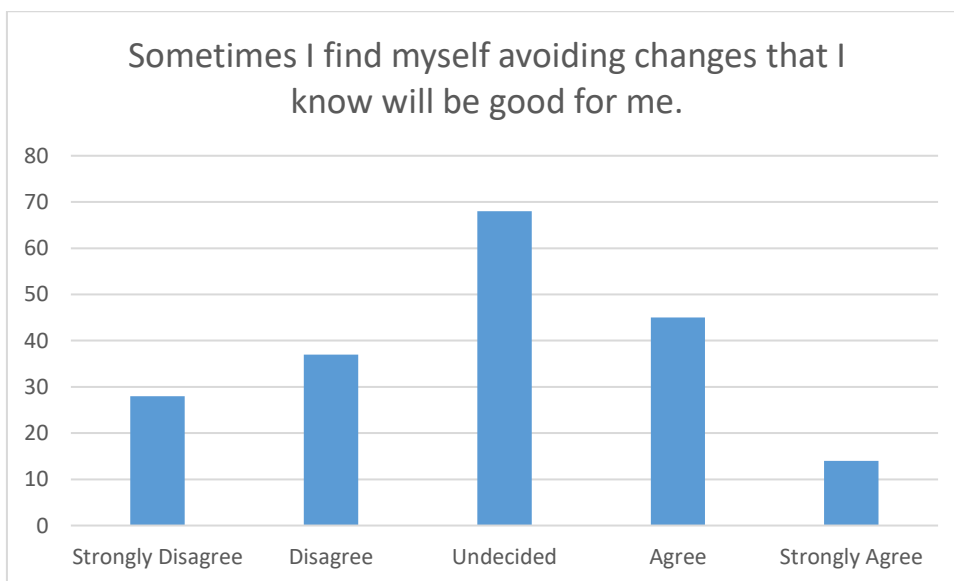
Source: Jose Tonatiuh Delgado Cardenas, Plant-based meat survey 2022

16. I constantly change my mind.

We can observe that a greater tendency 44% of the respondents to disagree with the statement that they constantly change their minds.

While 32% of those surveyed remained undecided, and a smaller percentage (24%) agree that they constantly change their mind.

Table 7.27: I constantly change my mind.

	Frequency	Percentage
Strongly Disagree	34	18%
Disagree	50	26%
Undecided	62	32%
Agree	28	15%
Strongly Agree	18	9%

Source: Jose Tonatiuh Delgado Cardenas, Plant-based meat survey 2022

Graph 7.27: I constantly change my mind.
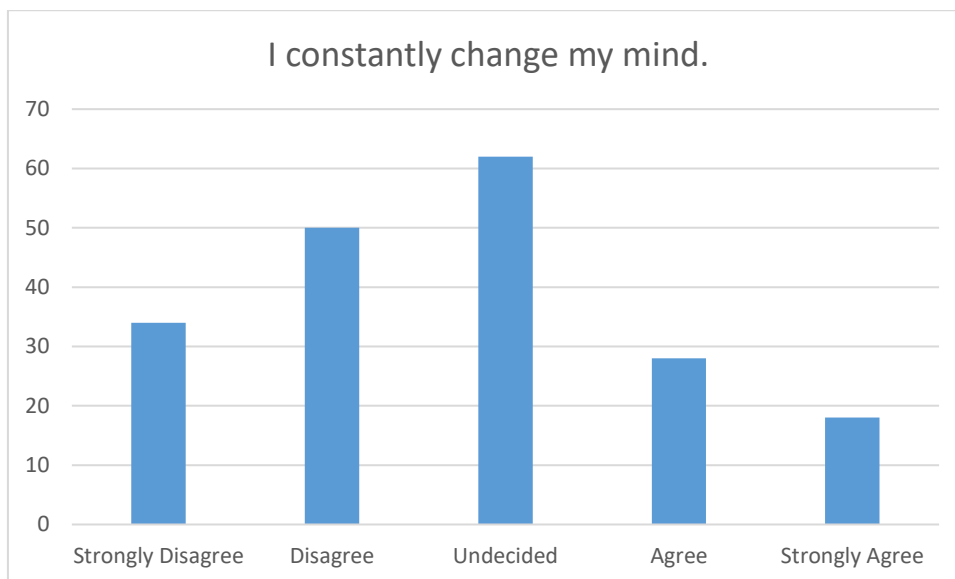
Source: Jose Tonatiuh Delgado Cardenas, Plant-based meat survey 2022

17.   Buying traditional meat is something:

Respondents were asked if buying traditional meat is something they do automatically, that if they didn't it would be rare, or something typical that they would do.

We can observe that in the case of buying traditional meat automatically and as something typical that they would do, the respondents tend to agree with the statement, however they adopted an indecisive position when knowing if it would make them feel strange if they did not buy it.

I do automatically.

Table 7.27.1: Buying traditional meat is something

	Frequency	Percentage
Strongly Disagree	8	4%
Disagree	12	6%
Undecided	47	25%
Agree	59	31%
Strongly Agree	66	34%

Source: Jose Tonatiuh Delgado Cardenas, Plant-based meat survey 2022

It would make me feel weird if I did not do it.

Table 7.27.2: Buying traditional meat is something

	Frequency	Percentage
Strongly Disagree	34	18%
Disagree	49	25%
Undecided	58	30%
Agree	28	15%
Strongly Agree	23	12%

Source: Jose Tonatiuh Delgado Cardenas, Plant-based meat survey 2022

It's a typical thing I would do.

Table 7.27.3: Buying traditional meat is something

	Frequency	Percentage
Strongly Disagree	11	6%
Disagree	25	13%
Undecided	61	32%
Agree	47	24%
Strongly Agree	48	25%

Source: Jose Tonatiuh Delgado Cardenas, Plant-based meat survey 2022

Table 7.27.4: Buying traditional meat is something

	I do automatically	It would make me feel weird if I did not do it	It's a typical thing I would do
Strongly Disagree	4%	18%	6%
Disagree	6%	25%	13%
Undecided	25%	30%	32%
Agree	31%	15%	24%
Strongly Agree	34%	12%	25%

Source: Jose Tonatiuh Delgado Cardenas, Plant-based meat survey 2022

Graph 7.27: Buying traditional meat is something

Source: Jose Tonatiuh Delgado Cardenas, Plant-based meat survey 2022

18. Buying plant-based meat is something:

Respondents were asked if buying plant-based meat is something they do automatically, that if they didn't it would be weird, or something typical that they would do.

We can observe that in the case of buying plant-based meat there is a great tendency to disagree and strongly disagree with the statement of each of the questions by the respondents.

This shows that in fact Mexican consumers do not contemplate nor are familiar with purchasing or consuming plant-based meat.

I do automatically

Table 7.28.1: Buying plant-based meat is something

	Frequency	Percentage
Strongly Disagree	96	50%
Disagree	36	19%
Undecided	37	19%
Agree	12	6%
Strongly Agree	11	6%

Source: Jose Tonatiuh Delgado Cardenas, Plant-based meat survey 2022

It would make me feel weird if I did not do it.

Table 7.28.2: Buying plant-based meat is something

	Frequency	Percentage
Strongly Disagree	87	45%
Disagree	42	22%
Undecided	36	19%
Agree	19	10%
Strongly Agree	8	4%

Source: Jose Tonatiuh Delgado Cardenas, Plant-based meat survey 2022

It's a typical thing I would do

Table 7.28.3: Buying plant-based meat is something

	Frequency	Percentage
Strongly Disagree	68	35%
Disagree	53	28%
Undecided	46	24%
Agree	18	9%
Strongly Agree	7	4%

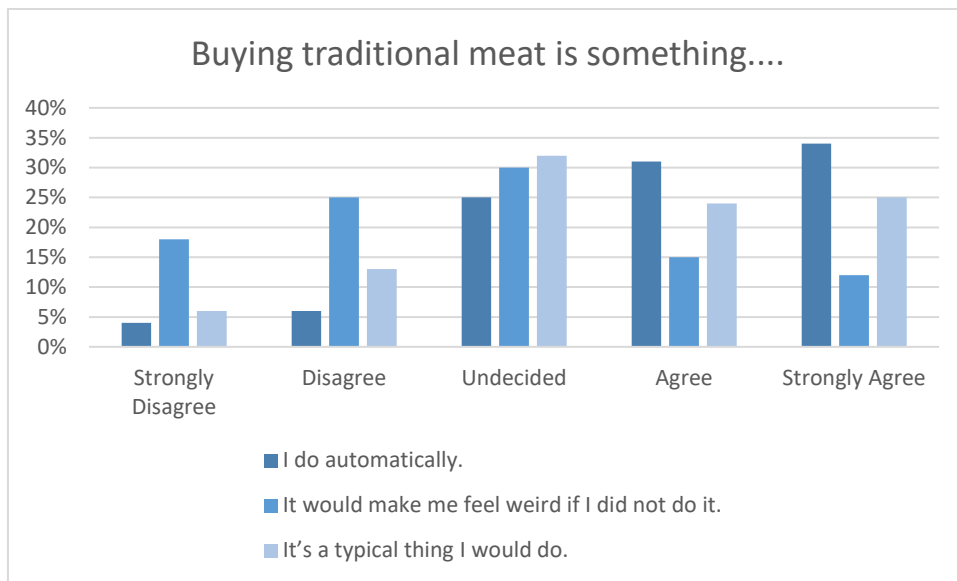**Source: Jose Tonatiuh Delgado Cardenas, Plant-based meat survey 2022**

Table 7.28.4: Buying plant-based meat is something

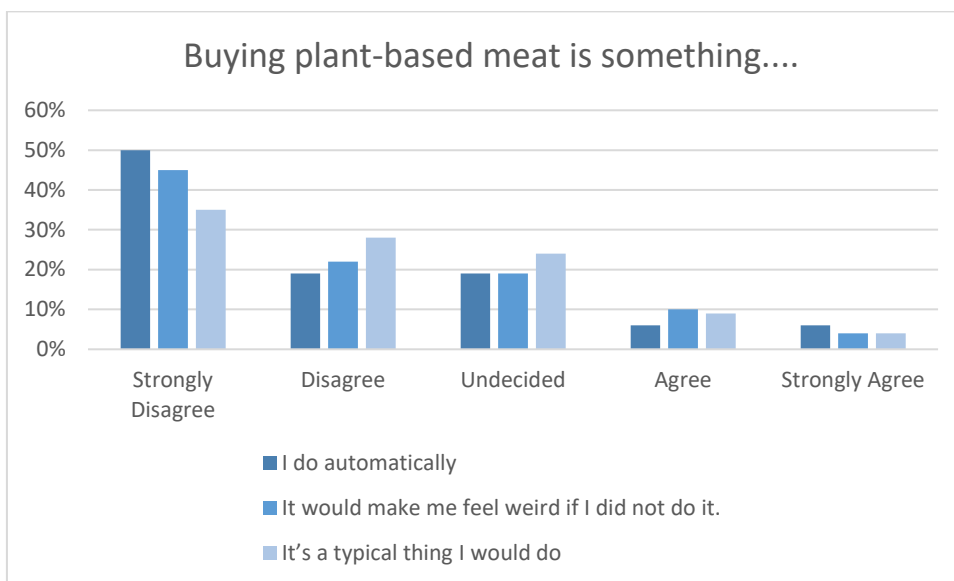|	I do automatically	It would make me feel weird if I did not do it	It's a typical thing I would do
Strongly Disagree	50%	45%	35%
Disagree	19%	22%	28%
Undecided	19%	19%	24%
Agree	6%	10%	9%
Strongly Agree	6%	4%	4%

Source: Jose Tonatiuh Delgado Cardenas, Plant-based meat survey 2022

Graph 7.28: Buying plant-based meat is something:

Source: Jose Tonatiuh Delgado Cardenas, Plant-based meat survey 2022

19. When choosing which food products to buy, I believe it is also my duty to consider the environmental and social consequences of this choice.

The majority of the respondents (63%) feel that they have a duty to consider social and environmental consequences when choosing which food products to buy.

There is an important proportion of the participants (28%) took a neutral or indecisive position.

While only a small proportion (9%) of the respondents tend to disagree with the statement of the question.

Table 7.29: Environmental and social consequences

	Frequency	Percentage
Strongly Disagree	3	2%
Disagree	13	7%
Undecided	55	28%
Agree	48	25%
Strongly Agree	74	38%

Source: Jose Tonatiuh Delgado Cardenas, Plant-based meat survey 2022

Graph 7.29: Environmental and social consequences

When choosing which food products to buy, I believe it is also my duty to consider the environmental and social consequences of this choice.
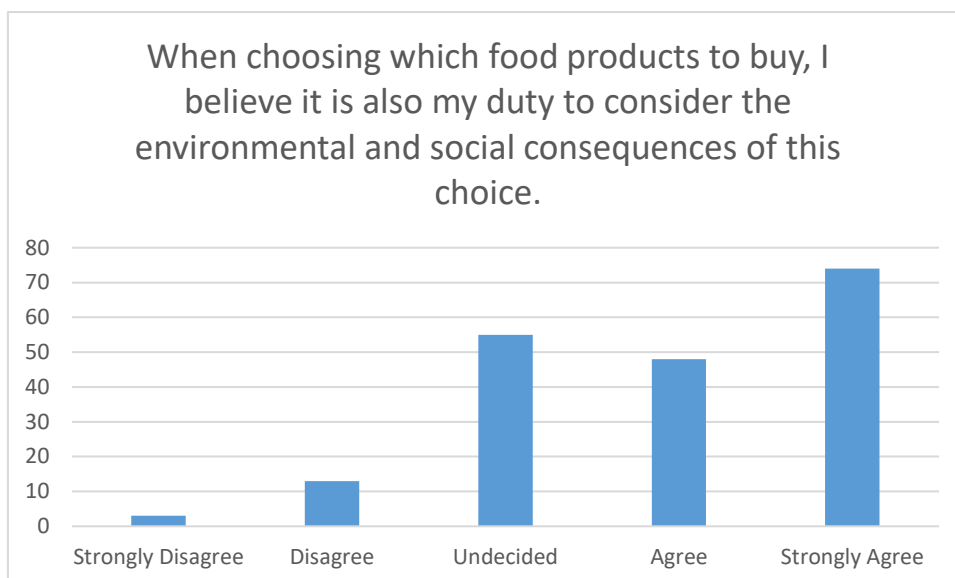
Source: Jose Tonatiuh Delgado Cardenas, Plant-based meat survey 2022

20.   Regardless of what others do, I feel morally obligated to minimize the negative impact of my purchasing choices on the environment.

We can observe that there is a tendency on the part of the respondents to feel morally bound to minimize the negative impact of their purchase choice on the environment, 23% agreed while 26% totally agreed with the statement of the question.
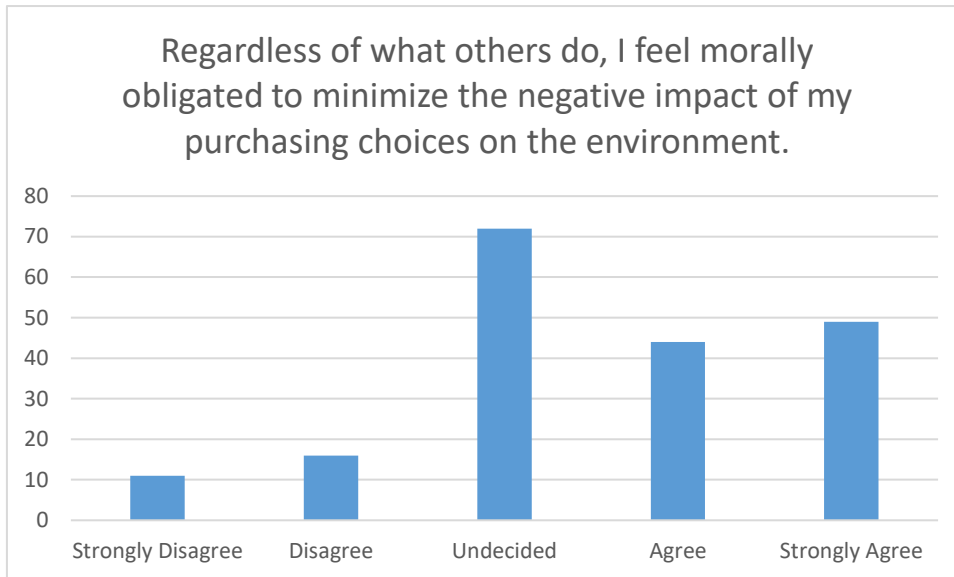
On the other hand, 37% of those surveyed considered themselves undecided and a small percentage, 14%, disagreed.

Table 7.30: Moral obligation to minimize the negative impact

	Frequency	Percentage
Strongly Disagree	11	6%
Disagree	16	8%
Undecided	72	37%
Agree	44	23%
Strongly Agree	49	26%

Source: Jose Tonatiuh Delgado Cardenas, Plant-based meat survey 2022

Graph 7.30: Moral obligation to minimize the negative impact

Regardless of what others do, I feel morally obligated to minimize the negative impact of my purchasing choices on the environment.

Source: Jose Tonatiuh Delgado Cardenas, Plant-based meat survey 2022

21.   Please indicate how relevant the following benefits of a plant-based diet are:

Respondents were asked how relevant or irrelevant a certain benefit of following a plant-based diet is using a Likert scale from highly irrelevant to highly relevant.

The benefits to be analyzed were environmental protection, animal protection and health problems.

The question was later supplemented with an open sub-question which gave the respondent the option of providing other answers not considered by the author of the survey.

The results show that most of the respondents consider that the above-mentioned benefits are relevant rather than considering them as irrelevant. Observing the graph # we can visually observe that there is a relevance for these benefits.

Environmental protection (water use, land use, etc.)

Table 7.31.1: Plant-based meat benefits – environmental protection

	Frequency	Percentage
Highly irrelevant	2	1%
Likely to be irrelevant	9	4.9%
More or less relevant	35	18.9%
Likely to be relevant	55	29.7%
Highly relevant	84	45.4%

Source: Jose Tonatiuh Delgado Cardenas, Plant-based meat survey 2022

Animal protection

Table 7.31.2: Plant-based meat benefits – animal protection

	Frequency	Percentage
Highly irrelevant	3	1.5%
Likely to be irrelevant	10	5.2%
More or less relevant	40	20.8%
Likely to be relevant	40	20.8%
Highly relevant	99	51.6%

Source: Jose Tonatiuh Delgado Cardenas, Plant-based meat survey 2022

Health problems

Table 7.31.3: Plant-based meat benefits – health problems

|	Frequency	Percentage
Highly irrelevant	1	0.5%
Likely to be irrelevant	10	5.2%
More or less relevant	37	19.3%
Likely to be relevant	44	22.9%
Highly relevant	100	52.1%

Source: Jose Tonatiuh Delgado Cardenas, Plant-based meat survey 2022

Table 7.31.4: Plant-based meat benefits summary

	Environmental protection (water use, land use, etc.)	Animal protection	Health problems
Highly irrelevant	1%	1.5%	0.5%
Likely to be irrelevant	4.9%	5.2%	5.2%
More or less relevant	18.9%	20.8%	19.3%
Likely to be relevant	19.7%	20.8%	22.9%
Highly relevant	45.4%	51.6%	52.1%

Source: Jose Tonatiuh Delgado Cardenas, Plant-based meat survey 2022

Graph   7.31:   Plant-based   meat   benefits
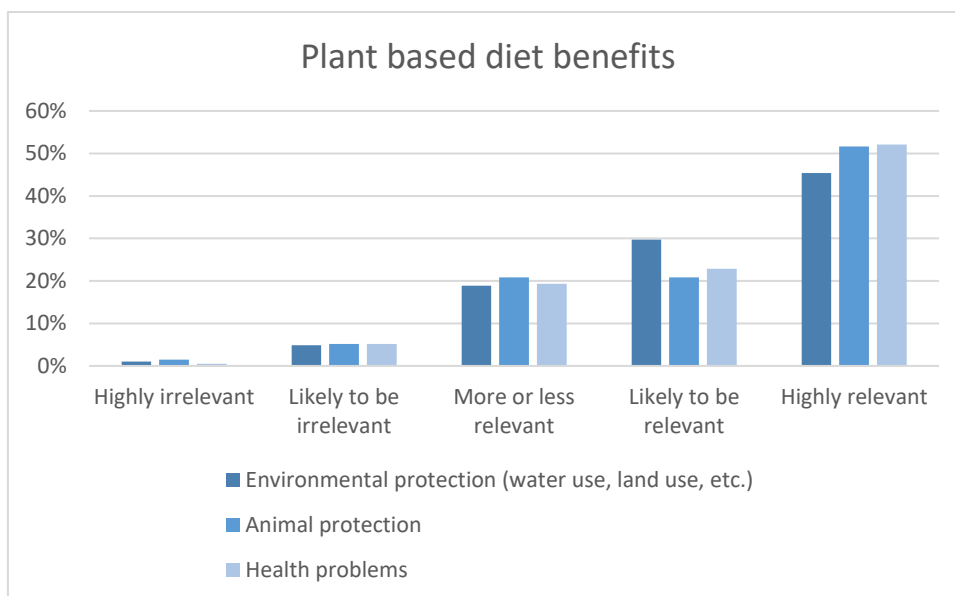
Source: Jose Tonatiuh Delgado Cardenas, Plant-based meat survey 2022

Other (please specify)

Some benefits stressed by the respondents in the open question where that PBM offers a positive change in their health, offering more vitality, quality of life and in general a healthier life.

Respondents also acknowledge some plant-based diet benefits related to current social challenges such as overpopulation and the economy.

22.   How much more would you be willing to pay to buy plant-based meat instead of traditional meat?

The results of this question show that 26.6% of those surveyed would not be willing to pay more than what they pay for traditional meat.

However, most of the respondents (35.9%) would be willing to pay up to 5% more than what they pay for traditional meat to consume plant-based meat while 25% would be willing to pay up to 10%.

On the other hand, 7.3% and 5.2% of those surveyed would be willing to pay up to 15% or more than 15% extra, respectively.

Table 7.32: How much more would you be willing to pay to buy plant-based meat instead of traditional meat?

	Frequency	Percentage
I am not willing to pay more	51	27%
Up to 5%	69	36%
Up to 10%	48	25%
Up to 15%	14	5%
More than 15%	10	7%

Source: Jose Tonatiuh Delgado Cardenas, Plant-based meat survey 2022

Graph 7.32: How much more would you be willing to pay to buy plant-based meat instead of traditional meat?
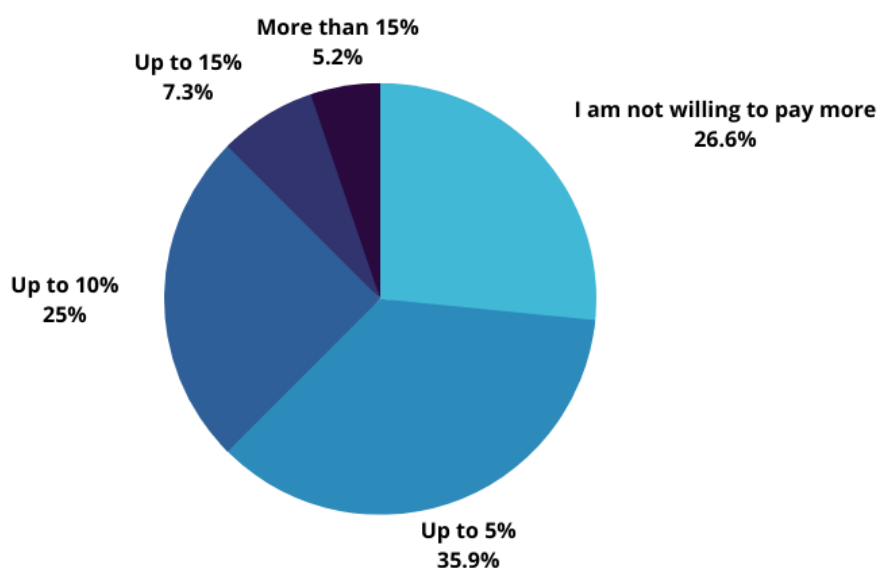
Source: Jose Tonatiuh Delgado Cardenas, Plant-based meat survey 2022

Conclusions

To the author's knowledge, this is the first study on the Mexican consumer's perception of plant-based meat. The different sections of the questionnaire allowed us to explore both the demographics and the behaviors of the respondents.

The demographic section found that almost all the survey participants were single women with a high level of education where the majority of respondents had at least a bachelor's degree, aged between 18 and 27 years, students and dependent workers with an average family income compared to the national average of $11,000 MXN per month.

The dietary section for its part revealed that respondents are indecisive when it comes to deciding their attitude and behavior in the present and in the future towards meat-based products.

It was observed that the Mexican consumer is in favor of being constant for which it could be difficult to change their eating habits.

The results of this section showed that most of the respondents define themselves as omnivorous and tend to buy their own food, consider eating meat as a habit and consume it on an average basis.

The Mexican consumer is not familiar with the concept of plant-based meat. In fact, the vast majority of those surveyed have never tried plant-based meat and those who have, do not consume it as a daily food, if not rarely. However, the idea of eating plant-based meat does not bother them, and they showed that they would be willing to try it if they had the possibility even if they do not feel any kind of pressure from their friends or family, so we can say that there is a genuine interest in part of the Mexican consumer towards this type of product.

In addition, the Mexican consumer considers that in general the price, taste, image and general experience of plant-based meat are acceptable, in addition to this, they are aware of the environmental, health and animal welfare benefits that this meat can offer. type of products.

In economic terms, the Mexican consumer would be willing to pay up to 5% extra for plant-based meat compared to what he pays for traditional meat.

Plant-based meat have been in constant evolution, and they have been in constant evolution going from being a simple and tasteless alternative of traditional meat to being a product that offers a similar look, protein, and flavor of the animal-based meat.

PBM products are on a spectrum where in terms of sensory and nutritional aspects where some of them are not an exact replica of traditional meat but are very close to it and in addition to this, these types of products are labeled by consumers as cleaner and more natural products.

While on the other hand, the more processed PBM products mirrors the experience of eating traditional meat, however, these products are usually viewed by consumers are highly processed.

Searching new natural sources of protein could be the solution to finally being able to completely copy traditional meat without having to opt for highly processed process, and therefore, to be able to satisfy all ranges of consumers.

The success of plant-based meat or other meat alternatives in the marketplace could transform rather than replace the production of animal-based meat. For instance, PBM could fill the demand for low-quality meat by offering a product that perhaps lacks some sensory or nutritional aspects, but with a cleaner and natural background, allowing ABM producers to focus their efforts and resources on improving the aspects that could be negative on their industry and consequently increasing the quality standards on traditional meat producers.

Unfortunately, today, plant-based meats still face a bad perception from individuals which consider the product to be an ultra-processed products by consumers, some of these processes can be even hazardous to health, affecting the image of a healthy product that is sought to be transmitted to the consumer.

In order to face these challenges developers in the field of meat analogues will have to continue with the innovation, research, and technological development. Implementing more clean label ingredients and designing more efficient PBM production processes will allow to produce less processed products that meet consumer necessities by delivering a product that contains proteins with greater

nutritional value where antinutrients and masking agents are reduced and finally find alternatives that gain a better image by the consumers.

Future expectations are that PBM might have to compete with the evolution of the processes of traditional meat, for instance, the so-called cultured meat or cellular agriculture which consists of meat produced by animal cells. This type of meat will also have the potential to address the environmental and animal welfare issues which are some of the main drivers for consumers to opt to consume PBM instead of traditional meat. However, as to date is not currently being commercialized since is still an experimental product.

Although there was no reference to any previous study on plant-based meat in Mexico, valuable insights about the Mexican consumer and their relationship with plant-based meat were obtained.

The author expects that this thesis will serve as a basis for future research as well as a complement to research already underway in the food industry.

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