A Work Project, presented as part of the requirements for the Award of a Master's degree in Management from the Nova School of Business and Economics.

# SCENARIOS FOR THE FUTURE OF THE AGRIFOOD INDUSTRY – STRATEGIC RECOMMENDATIONS AND FUTURE STEPS FOR X

## THE SCENARIO OF "GRAINS FOR THE GAINS"

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## Abstract

In this work project, foresight methodology was employed to develop scenarios aimed at improving company X's decision-making process. The project focuses on the globalization of grain trading companies and considers potential developments up until 2030. The scenarios were generated using the Intuitive-Logics School approach, and driving forces were identified through an analysis of the external environment using the STEEP framework and the clustering method. Key uncertainties were determined through a survey completed by X's employees using Delphi statements. The results of this survey were used to develop four contrasting scenarios, which were then strategically analyzed to provide recommendations for X.

The thesis covers the scenario, "Grains for the Gains" resulting from the configuration of the two key uncertainties: low degree of regionalization with global sourcing and high acceptance of substitute and alternative products for animal protein.

**Key Words: Foresight, Scenario Planning, Business Strategy, Uncertainty, Driving Forces, Trade, Agrifood, Grain**

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# Table of Contents

## List of Figures



## List of Tables

# 1 Introduction

*"Victorious warriors first win and then go to war, while defeated warriors first go to war and then try to win."* This is a quote from "The Art of War", the oldest book on military strategy written by Sun Tzu, a Chinese military general who lived between the 6th and 5th centuries BC. Even then, it was clear how fundamental strategic planning is in order to be able to successfully face the obstacles that the future holds and not be found unprepared, ending up being victims of our own ineffectiveness.

Adapted to the present day, this wisdom proves to be even more fundamental. Different scenarios may not depict ideal futures, challenging companies to develop and adopt specific strategies to face a vibrant macroenvironment. The Russian-Ukrainian war, the effects of the COVID-19 pandemic, the constant growth of the world population with an increase in demand for primary goods, and changing international market conditions in favor of China can be counted among the many causes of a plausible turbulent future. We cannot predict the future with certainty, but we can prepare for various plausible scenarios to reduce the risk of being taken by surprise without the tools necessary for an effective response.

Considering the vast number of plausible futures, strategic foresight and scenario planning provide the necessary knowledge to be able to make conscious and educated decisions. This report aims to supply that wisdom to X, a well-established company in the Portuguese grain trading industry.

The foresight project employs the methodology of the Intuitive-Logics school, which was innovatively adapted to meet the needs of X better. Overall, the methodology was applied in five phases, providing the foundation for the structure of this report. Hence, the report will start with the definition of a specific focal issue and time horizon that will drive the entire study. Subsequently, a deep analysis of X's macro environment will be performed to identify the main driving forces that have the potential to impact the success or failure of the focal issue. These will be starting points for the development of four plausible scenarios that X could face. Each

scenario will be analyzed from a strategic perspective by utilizing an innovative guideline that integrates various frameworks. This guideline allows for the development of consistent strategic recommendations across scenarios. In the subsequent phase, general strategic recommendations that are likely to be effective in a broad range of scenarios will be developed. Lastly, a monitoring system is designed to anticipate the development of each scenario.

This work will study the influence that regionalization and the acceptance of alternative and substitute products for animal protein would have in society. The different configurations of these factors, or uncertainties, will force X to make strategic decisions to adapt to plausible futures.

## 2 Methodology

After conducting an evaluation of various foresight methodologies, the Intuitive-Logics School was determined to be the most appropriate methodology in X's context. This approach is also known as the Shell School, as it originated with Pierre Wack, who served as the head of scenario planning in the business environment division of the Royal Dutch/Shell Group (hereafter, Shell) from 1971 to 1981. Peter Schwartz then succeeded Wack as head of Shell's scenario planning department in London, extending the study of scenarios and planning beyond the energy questions (Wayland 2017). Nowadays, Intuitive-Logics scenarios are used in organizational development, strategic management, policy development, and other fields to explore the "'limits of possibility for the future" (Wright, Bradfield and Cairns 2012).

As the name suggests, the Intuitive-Logics School relies on the use of intuition to develop scenarios that represent a range of plausible futures, some of which may not be ideal (Wright, Bradfield and Cairns 2012, 4). In addition, this approach integrates the factors from STEEP (Social, Technologic, Economic, Environmental, Political), explores how they interact in the different futures, and tries to identify their effects on the industry. Thus, the main objective of

the Intuitive-Logics School is to understand causal relationships and how the future will progress.

It is worth noting that the intuition used as the foundation of this approach is that of experts, in this case, X's employees. As such, they play a crucial role in the creation of the scenarios. It is also key to comprehend that within this methodology, the scenarios will deal with extreme situations, meaning that the middle ground will not be studied.

The methodology was adapted to fit X's specific needs and identify the most critical uncertainties from its macro-external environment. To do so, the clustering method will be applied, which helps to reveal and understand the causal relationships between the various factors influencing reality. By examining the connections between these factors, it is possible to identify the underlying driving forces. (Cairns and Wright 2018, 38).

The driving forces will then be used to formulate Delphi statements, as performed by Czaplicka-Kolarz, Stańczyk, and Kapusta (2009). The Delphi statements serve as a basis for the survey in which the intuition of the specialists is taken into consideration. Two of these forces, the ones that resulted in the creation of the statements with the highest uncertainty and impact, will subsequently be the chosen uncertainties to be crossed in a scenario matrix (Ecobici 2017).

Following the Intuitive-Logics School methodology, a process of five phases will be followed. These five phases are used as a basis for the project developed in cooperation with X. The first phase of the process is called "framing and scoping", in which research will be done to determine the focal issue and the time horizon (Garvin and Levesque, 2006). In the second phase, called "explore", a horizon scan will be performed to identify megatrends, trends, weak signals, and wild cards. These will be used to identify and understand the driving forces, which will be essential to build the Delphi statements and the following survey to send to the experts (Garvin and Levesque 2006). The third phase, "Synthesise", will be slightly adapted to fit the needs of this project better. In accordance with the procedure set by the Intuitive-Logics School,

the scenario framework will be applied, and different scenario narratives will be created (Garvin and Levesque 2006). However, strategic analysis and the generation of strategic recommendations for each scenario are moved up to this phase. This will ensure that the strategic analysis and recommendations (usually made in phase four) are in one part with the scenarios. This allows each group member to contribute a meaningful individual part to the work project that is coherent, which will ultimately simplify the understanding for the reader. Following this, in phase four, "global recommendations", general strategic recommendations that are promising in a wide set of scenarios will be formulated. These will be subject to be presented to the management of the company (Garvin and Levesque 2006). Finally, in phase five, "monitor", early indicators will be suggested to X to evaluate the progress of the recommendations and if there are any required changes. The strategic recommendations suggested should be the main part of the discussion with the company, as it will allow for important conclusions to be made (Garvin and Levesque 2006).

## 3 Phase I: Framing and Scoping

For companies, there are a lot of uncertain futures that come attached to different issues, and thus, the scenario-building process should have specified guidelines. After gaining a thorough understanding of X's long-term goals and expectations, a focal issue with supporting questions and a time horizon were identified to guide the foresight project and maintain focus on the most critical aspects.

A focal issue can be compared to an anchor because it roots the study and keeps it from straining to irrelevant grounds while providing a foundation to base it on. In simpler terms, it defines the scope within which the team will work.

The breadth of the focal issue is dictated by the chosen time horizon, which prescribes the time period to be covered. This may range from short-term (up to 1 year) to long-term (more than 15 years in the future) (Paliokaité 2014). Within this timeframe, there will be significant

ruptures in the industry that warrant an analysis of the future. All assumptions and expectations throughout the study will be based on this long-term estimate, and all strategic decisions will be expected to take place within this timeframe.

Both the focal issue and the time horizon have been agreed upon with the company in order to make sure the project is significant within X's strategy.

### 3.1 Focal Issue and Supporting Questions

To guide the project, the focal issue will be the following:

*The globalization of grain trading companies and the future steps for X: expansion, sustainable portfolio extension and threats.*

This focal issue dives into the challenges that X and the entire grain and by-products industry will face, both in logistics and sustainability terms. In order to avoid generalist arguments that would not provide interesting and useful insights surrounding this problem, some main issues to focus our study on have been highlighted. These main issues are dictated by the following "supporting questions":

- What is the future of grain and grain derivatives market?
- What are its logistics issues and future challenges and threats?
- Should X extend its product portfolio?
- Should European grain and grain derivatives trading companies expand abroad?
- What competitive advantage would X have over competitors?

These questions will help guide the project in the right direction, taking into consideration the actual geo-political and geo-economic situation, the plausible future, and X's needs and objectives for the future, which are:

- Growth in market share in the import of raw materials to the Portuguese market.
- Increase in GOM (Gross Operating Margin) in conventional business areas, which include organic cereals for Nestlé and the rice tri-corner.

- Reduction of COSEC costs associated with the condition of immediate payment in ca. 60 mil sales.
- Diversification of clients and products in the agri-food area.

Having a closer look at X's goals and the supporting questions, it is possible to note that they are linked. For example, X wants to grow in market share in the import of raw materials to the Portuguese market (first point) – which raw materials? How will this "market" look like in the near future? In other words, what is the future of grain and grain derivatives market?

Once all these main challenges and doubts are clarified, X will have a clearer vision of its future and the one of its industry, thus navigating towards a specific destination that will lead the company to succeed.

### 3.2 Time Horizon

The world has been experiencing an unusual situation these last few years. Firstly, economies are still recovering from the COVID-19 pandemic. Secondly, the current war between Ukraine and Russia will have consequences that will affect every business and economy, especially the grain one, as Ukraine is one of the most important European suppliers of grains and grain derivatives (Eisele 2022).

The recent growth in gluten-free products has been a factor on our Time Horizon, as it is expected to grow at a CAGR of 9.8% until 2030 (Grand View Research 2021), which will affect the grain and grain derivatives products growth. When mixing this with the prevalence of celiac disease and other diseases related to unhealthy lifestyles, businesses will need time to adapt to the changes in the market in order to keep thriving.

Contrary to a couple of years ago, nowadays, we live in a world where trends emerge quite rapidly, and in order to feel included, people tend to change accordingly. This is mainly due to the evolution of social media, which allows an easier and faster spread of information. The newborn increase in environmental awareness will also lead companies to be more aware of the

effect they will have on the environment. All these factors mean that businesses will need to adapt and be prepared to follow the new tendencies in order to maintain their clients and advantage.

An important factor in selecting the time horizon was the New CAP (Common Agricultural Policy) which, despite being signed in 2021, will be active from 2023 until 2027 (Matthews 2018). This policy will allow agriculture to become more competitive and take care of the environment. The policy will be helpful as it will allow for a larger amount of good quality products.

Through research, the team found that the global usage of cereals is expected to grow from 2.7 bln tons to 3.0 bln tons by 2030, but this value might change due Russian-Ukrainian war. Nevertheless, the usage of cereals is expected to grow, and the two main causes will be the higher feed use, followed by the growth in usage for food producers. The global trade of cereals is also projected to grow by 21% until the end of 2030. Again, war might affect these values (OECD/FAO 2021).

Additionally, according to a NASA study, climate change will impact crops as close as 2030, affecting the production and consequently availability of maize and corn due to greenhouse gas emissions (Gray 2021). This would impact the core business of X and alter the general industry in which it is competing.

Based on the information collected, and keeping in mind that it should be aligned with X's goals and the focal issue, the selected Time Horizon is seven years until the end of 2030. In fact, one of X's goals is to double its EBITDA (earnings before interest, taxes, depreciation, and amortization) from 2021 by the end of 2030, which lines up with the study's timeframe. (X 2022).

# 4 Phase II: Explore

The second phase – explore – aims to conduct retrospective analysis and research about X's environment and to discuss the main forces involved. All these activities can be reassembled and traced back to a specific concept, the concept of horizon scanning.

In prospective or anticipatory activities, horizon scanning is crucial because it allows for the exploration of potential futures, the assessment of "emerging issues", the detection of various signals, and the estimation of the significance of "things to come" (Cuhls 2019).

## 4.1 Horizon Scanning

After framing the Focal Issue as well as the Time Horizon, which will guide the entirety of the scenario thinking process, the following procedure will consist of analyzing the external environment of X. The scanning process was done to understand which forces could have an impact, positive or negative, in the described focal issue to help pinpoint the main driving forces. The team utilized a scanning approach focused on identifying megatrends, trends, weak signals, and wildcards. In order to spot them, a STEEP analysis (Social, Technological, Economic, Environmental, and Political) was used. All considered factors presented in the scanning have a level of impact on the organization and are out of its control.

Megatrends are long-term processes of transformation that tend to shape the future of the markets. According to the accepted definition, a megatrend has a broad social and economic impact, and therefore it is not confined to one domain or discipline (Radosław 2018). In this specific project, megatrends will cover an essential role. They will be useful to deeply understand the Delphi statements that are defined below, whose origin can be found in such megatrends and trends.

Trends are described as a declaration of the direction of change. Usually, trends are gradual and long-term changes that will shape the future of an organization, nation, sector and/or society.

Weak signals are external or internal warnings that are too incomplete to allow for a precise estimation of the level of impact or to determine an accurate response. Igor Ansoff defended

the use of information that are weak signals (defined by him as “strategic surprises” which can assume the form of threats or opportunities) as mechanisms or instruments capable of helping to anticipate future events (Ansoff 1984).

Wild cards refer to unique incidents with a perceived low probability of occurrence, but in the event, they come to light, they will have high impacts and strategic consequences for an organization or society itself (Mendonça 2003). The events of September 11th are a good example of a wild card, as the terrorist attacks were unexpected and had a strong impact on the future.

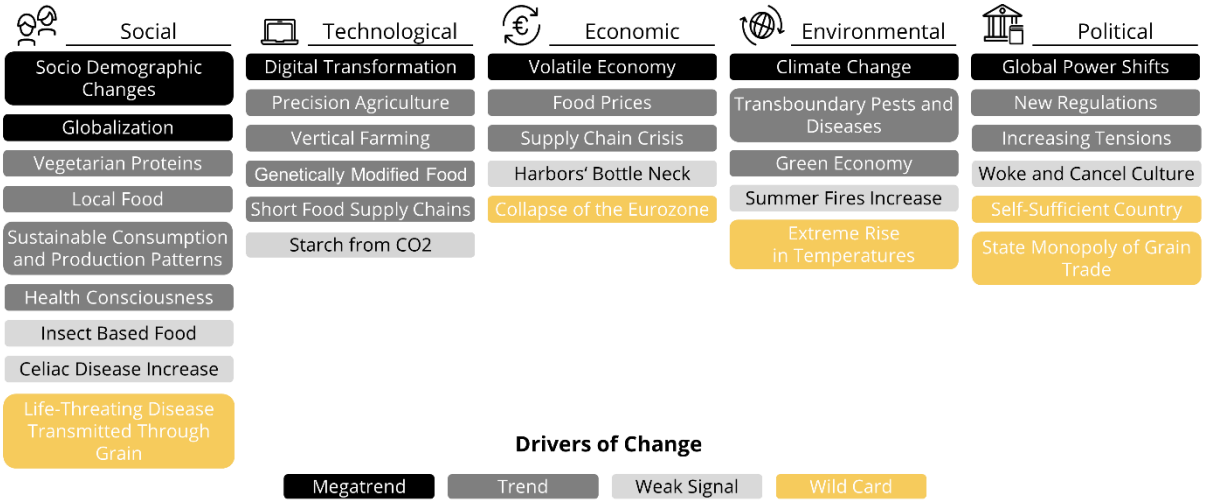


***Figure 1: STEEP Taxonomy***

### 4.1.1 Megatrends

*Socio Demographic Changes*

The world population is expected to grow to at least 8.5 bil by 2030 (Winston 2019). According to estimates, life expectancy is estimated to keep increasing at a steady pace, and the demographic group with the fastest growth will be the group over 65 years (Winston 2019). In addition, we are able to observe that, in Europe, the population is going to increase in the future decades (United Nations 2019). Population growth will result in an increased demand for raw materials and resources. The demand for food is estimated to see an increase of 56% by 2050 compared to 2013. Furthermore, in 2050, it is expected that 68% of the population will live in

cities (United Nations 2019). Urbanization will also affect food consumption patterns as a higher income will increase the demand for processed food and meat.

*Globalization*

Globalization is a term used when referring to growth in interdependencies across the world, between individuals, states, and societies. Technological progress, such as the evolution of internet, innovations in processes, making communication easier, are some of the causes that led to globalization and its fast evolution. Globalization has an incredibly positive impact on the agriculture market and every business connected and dependent on this industry. It has also been a driver in the increase of productivism in agriculture. Meaning that there has been an increase in the farms that well-financed corporations use. Globalization has also allowed for a bigger broad of options for companies when searching for the best products as well as opportunities for framers to showcase their productions and quality.

*Digital Transformation*

Digitalization has already been with us for several decades. It is based on the fundamental concept of digitization, which means that data or information is transformed from analog to digital. This allows information to be easily copied, edited and transferred (Futures Platform 2022).

In the next years, digital technologies will continue to spread into all areas of our lives and further reinforce how we interact. In this context, the potential is great that many industries will continue to be disrupted and revolutionized in the course of digitalization (Z_punkt 2022 S. 12).

For cross-border trade in goods, there is still an enormous potential as much of the trade and supply chain data is still exchanged in paper format. Before being processed, the data is often transmitted manually between different IT systems, making the process error-prone and inefficient, which in turn increases economic and environmental costs. The problem behind the

limited adoption of digitalization opportunities in cross-border trade is manifold, lacking of coordination leads to many digital islands, and the absence of the appropriate legislative frameworks leave high legal uncertainty in some countries. The Digital Standards Initiative (DSI), established by the International Chamber of Commerce (ICC) in 2020, aims to address these challenges facing trade digitalization efforts (Nguyen 2022, S. 40–41; ICC 2022). The digitalization of the supply chain has a high potential to facilitate trade. Duval et al. (2018) estimate that all digital trade facilitation measures together could reduce trade costs by more than 26%.

*Volatile Economy*

In Finance, volatility is a statistical measure of the dispersion of returns for a given security or market index (Investopedia 2022). In other terms, it refers to unpredictable and sometimes sharp price movements of the related asset. The markets' unpredictability directly leads to a loss of confidence and the need for organizations to be highly flexible and, therefore, adaptable to continuous changes of the business environment. Moreover, since nowadays' economy is highly volatile, the resulting uncertainty makes it extremely difficult for organizations to predict the future and make plausible forecasts by themselves.

Volatility can be caused by political factors as well as industry and sector factors. Markets' volatility can indeed be influenced by governments' decisions on specific trade agreements, legislation, and policy. On the other hand, there are specific events inside the industry or sector or in its macroeconomic environment that can affect its volatility (ex.: a major weather event for the agricultural sector or an internal change like new regulations for the specific sector) (Fidelity international 2022).

*Climate Change*

According to the United Nations, Climate Change refers to significant and long-term changes in weather patterns and temperatures (NASA 2014). The characterization of this phenomenon

embodies global warming, but it is not limited to it, as there are some events, like droughts and rising sea levels, which may be the result of the changing temperatures, but they are only encompassed in the climate change definition. Although a part of this swing may have a natural explanation, such as variations in the solar cycle, anthropogenic change is at the core of the problem, and when we are discussing climate change, this is the type we talk about. When it comes to agriculture, both the quality of the goods and the quantity will be affected as the years pass if climate change continues to aggravate. The change in precipitation patterns, droughts, and wildfires will be some of the factors that will influence the supply of food products, possibly leading to food scarcity. Despite this, studies by NASA have shown that due to high greenhouse gas emissions, there will be a positive effect on photosynthesis and water retention which thus leads to an increase in crop yields for wheat, possibly as soon as 2030. (Gray 2021) These same facts may have a complete opposite effect on corn, making it harder to grow in the tropics.

*Global Power Shifts*

As a result of globalization, we are seeing *global* power shifts as new countries emerge in the market and have increasing economic importance and presence. The shift in global power is due to the fact that economic growth is not uniform, and countries like Brazil, China, and India have benefited from being integrated into the global economy and being able to trade with countries that were already established in the global market and economy. Brazil, for example, is becoming one of the biggest economies because they benefit from having a large agricultural focus and being able to change into a more technological advanced sector. The global power shifts have opened doors not only for countries like Brazil and China, but also for countries that were already in the global market, as they now have new opportunities to invest in and use these opportunities to keep growing.

### 4.1.2 Trends

*Vegetarian Proteins*

With increasing awareness among consumers worldwide to eat healthily and sustainably, more and more are looking for alternative sources of proteins. Food companies that offer protein products that are healthy and sustainable are playing an increasingly important role in changing the diet of the population (Futures Platform 2022). For example, confectionery manufacturer Vital has been searching for a suitable alternative for chicken egg-white in their nougat for a long time. With potato protein, they have finally found a suitable alternative, which follows the structure of egg-white while having a neutral taste that does not alter the essential taste of the nougat (De Jong 2022). In addition to potato protein, there are a variety of other vegetarian protein sources that can be used. Thus, protein can be consumed from a variety of plant sources, including grains, pulses, soy products, vegetables, nuts, and seeds (Marsh et al. 2013, 7).

*Local Food*

The concept of local food is closely linked to the growing consumer trend of valuing locally produced goods that can be traced back to their origin. The reasons for this are that they are considered healthier, fresher as well as better for the environment and the local economy. In recent years, innovations and initiatives have emerged to give people easier access to local food (Futures Platform 2022). For example, the company Forager has developed a digital B2B sourcing platform that allows local farmers to connect with grocers so they can offer consumers locally cultivated food (Garcia 2021). However, currently Portugal's cereal production only meets 20% of it is consumption (TVI 2021).

*Sustainable Consumption and Production Patterns*

Sustainable Consumption and Production (SCP) is about doing more and better with less (UNEP 2022). It is the use and deliver of products and services in ways that minimize environmental impacts. SCP is so central nowadays that it is the 12th of the 17 ESG goals

described by the United Nations in 2015, and it is based on three main objectives: Decoupling environmental degradation from economic growth, applying life cycle thinking, and seizing opportunities for developing countries and "leapfrogging". Moreover, we can see that consumers' patterns have changed since most of the population nowadays is more sensitive to the environmental impact of their behavior. In this context, the number of vegans and vegetarians is significantly rising yearly. This will lead to a slight shift towards less consumption of meat and more cereals, and organic products.

*Health Consciousness*

In recent years health consciousness has been increasing in consumers' minds. It is the ability of each individual to care about their own health. This is directly related to the change in consumption patterns described above since people are willing to pay more for products that will not have a negative impact on their wellbeing. It covers both diet and lifestyle.

*Precision Agriculture*

Precision Agriculture (PA) describes a new approach to farming that uses modern IT solutions to ensure that crops are grown in the best possible conditions. For example, soil samples are taken, and yield data is analyzed in order to use fertilizers in a more targeted manner. This has the potential to reduce the cost of input factors, increase crop yield and reduce variability. Also, the negative impact on the environment can be limited as a reduction in the use of fertilizers lowers the pollution of the soil and water supplies (Cisternas et al. 2020, S. 1).

Especially in view of the increased food demand caused by the growing world population, PA could be part of the solution to deal with the daunting problems we are facing, which include changing weather conditions, environmental degradation, severe labor shortages, and the rising costs of input factors. Although there are already many technologies for precision agriculture on the market, there is still a lack of adaptation. This is partly due to the complicated application and the long-life span of agricultural equipment. In the coming years, however, it is expected

that the use of PA will become more widespread as technological applications become more user-friendly, and farmers must make new investments in new equipment (Johnson 2022).

*Vertical Farming*

In vertical farming, plants are not grown horizontally in the field, as is traditionally the case, but on the inside on several levels, one above the other. This allows the cultivation of agricultural products even in urban areas with limited space, thus saving transport costs. By providing plants with a controlled environment tailored to their needs, vertical farming has the potential to improve both the quality and quantity of the overall crop. Currently, however, the high real-estate cost, energy costs for lighting, and recycling of used water stand in the way of the widespread use of vertical farming. However, the large number of start-ups specializing in vertical farming and with ample financial resources give reason to believe that these problems will soon be solved, at least partly, and that the industry will continue to grow in the coming years (Futures Platform 2022).

*Genetically Modified Food*

Genetically modified (GM) crops are still rarely grown in the EU due to long-standing fears about their safety and environmental impact (Blenkinsop 2021). However, according to the WHO (2022), all GM foods currently available on the global market have passed safety assessments and therefore pose virtually no risk to human health. At the same time, GM plants bring advantages such as increased resistance to climatic change, disease, and pest infestation, and even the nutritional value can be increased. GM food can thus play an important role in the fight against climate change and help to ensure that the world's population will continue to be fed in the future (Poppy 2021). A study by (Eurobarometer 2019, S. 39) also indicates that in Europe, the level of concern regarding GM Foods has decreased significantly in recent years. Whereas in 2010, 69% were still critical of GM Food, in 2019 only 27% were. With increasing

acceptance and loosening restrictions, GM food will likely be ordinarily available in supermarkets in the future.

*Short Food Supply Chains*

As defined by the EU (2013) a short supply chain is "…*a supply chain involving a limited number of economic operators, committed to cooperation, local economic development, and close geographical and social relations between food producers, processors and consumers"*. Accordingly, SFSC are seen by many policymakers as a promising solution to meet the growing demand for affordable, nutritious, and healthy food in an environmentally responsible way (Futures Platform 2022). For example, the EU has funded the SMARTCHAIN project, which was established in 2018 with the aim of accelerating the shift to collaborative supply chains, promoting new business models and practical approaches to make the local food system more resilient (Eufic 2021).

*Food Prices*

Since the last decade, food prices have been fluctuating. The causes of these changes can be mainly credited to demographic changes (world population has been rising, and it will continue to: from the current 7.6 bil people in 2022 it's expected to reach 11.2 bil people by 2100, United Nations 2022), natural disasters, the decline of agricultural lands brought on by climate change and urbanization, the outbreak of a pandemic, and wars.

The Food and Agriculture Organization (FAO) counted that the average world market food price increased by 20.7% from February 2021 to February 2022, particularly noticeable in the sale of oil, dairy products, cereals, and meat. The major causes of this fluctuation are the COVID-19 pandemic. Still, the Russo-Ukrainian war is about to cause even worse effects, some of which are already visible since these two countries account for almost 30% of the total global wheat exports (Futures Platform 2022).

But what are the consequences of rising food prices? The most likely opinion on the one hand is that this price increase will devastate many people who can no longer afford these prices (especially in developing countries or countries highly dependent on imports). On the other hand, it will expedite regionalization of food products, decrease meat consumption, since it is becoming too expensive, and probably sponsor the development of a circular economy within the food supply chain.

*Supply Chain Crisis*

Today we are witnessing a global supply chain crisis that began back in 2020, in concomitance with the rising of the COVID-19 pandemic. The major causes of this crisis are shifts in demand, labor shortages (especially truck drivers), and structural factors (e.g.: old facilities). Moreover, the Russo-Ukrainian war has recently exacerbated issues (J.P. Morgan 2022). According to an Accenture study, 94% of the companies registered in the Fortune 1000 list had issues in their supply chain operations (Accenture 2022). This is why already in 2021, when McKinsey ran the survey, 93% of the companies surveyed already showed to have plans to make their supply of materials and products more resilient and agile, with many looking to diversify by "on-shoring" or "multi-shoring" production (Wired 2022).

The consequences of the global supply chain crisis are chip shortages, port congestion, rising commodity prices, and carrier shortages are some of the most visible effects of the supply chain disruptions that have recently harmed global commerce. (TECMA 2022).

*Transboundary Plant Pests and Diseases*

Transboundary plant pests and diseases (TPPDs) are, as the name suggests, migratory hazards that may lead to enormous losses in harvests and pastures and threaten the exchange of goods, consequently damaging the livelihood of citizens living in the affected areas. Within the Food and Agriculture Organization of the United Nations there is a team that closely examines the spread of TPPDs to be able to warn the affected countries early on, through the review of weak

signals (Food and Agriculture Organization 2022). The attempt to create cooperation between countries to prevent the spread of pests and diseases is also a major goal of this organization while also providing advice on sustainable and ecological solutions and managing options for the impacted regions.

*Green Economy*

A Green Economy involves the creation of wealth and development without detriment to the environment (UNEP 2022). It is characterized by being resource-efficient and socially inclusive while ensuring pollution is kept to a minimum level and not endangering biodiversity. According to the UN environmental program, there should be some sort of support for countries to transition to a green economy and to make the macro-economic policies that come with it more widely accepted and discussed on different geographical committees. Another area the program seems to focus on is the need for an emphasis on access to green finance, tech, and investments.

A big part of Green Economy are sustainable consumption patterns. In the late years, we have witnessed a massive shift towards a more sustainable lifestyle due to the acknowledgment that resources are finite. The need to fulfill needs without jeopardizing future generations has led to an increase in demand for companies, within several industries, with an understanding and appreciation of the ecosystem. Regarding agricultural companies, several certifications can assure the consumer that the company's process obeys voluntary sustainability requirements and is committed to better practices and continuous development.

Renewable energy sources are also key elements of the Green Economy, not only for B2C consumption but also from a B2B point of view. The use of renewables shows a shift in consumption that will aid in restricting emissions while also taking full advantage of resources that are widely available, thus lowering energy costs. As of late, it has been more commonly used and, in some areas, has even begun to be characterized as the most competitive energy

source (Deloitte 2022). It is expected that, in the year 2022, renewable energy growth will accelerate as consideration for the environment grows simultaneously.

*New Regulations*

New regulations strongly impact the business activities of every company, as they can change the company's philosophy. New regulations can have a positive impact on businesses. However, they can also negatively impact them, forcing them to change their strategic direction completely. The new CAP (Common Agricultural Policy) will positively impact the business because it will allow farmers to become more competitive and, at the same time, care for the environment. Consequently, the CAP will allow the companies connected to these farmers to also benefit from this new policy. On the other hand, future beef taxes may allow for the research of meat substitutes, allowing those companies to gain and have a bigger impact on the market. These taxes may even lead, in an extreme scenario, to an end of meat production, while in a more realistic scenario, it will only reduce meat production and consumption (Futures Platform 2022).

*Increasing Tensions*

Europe is now facing a war in Ukraine. This war led to an increase in tensions between Russia and the West. The western countries have been unified in support of Ukraine by giving them the means to fight this war, which also increased tensions. Russia has been suffering from severe economic sanctions from the West. These sanctions have put Russia in a challenging economic position, which led Russia to also react, as we have seen, by reducing or even cutting access to energy. This war will result in ramifications that will be felt throughout the next few years (Futures Platform 2022). We have also been seeing an increase in tensions between China and Taiwan, which will force another reaction from the West and, as a consequence, an increase in tensions between China and the West. These all together can put worldwide relations between countries in a fragile spot that can lead to harmful consequences. As tensions have been

increasing, the threat of the usage of nuclear weapons has also increased. The possible effects of this scenario would be catastrophic, including an immediate loss of life, infrastructure damage, and a reduction in the global production of food, due to the number of unusable grounds (Futures Platform 2022).

### 4.1.3 Weak Signals

*Insect Based Food*

Insect based food is not incorporated into the population's diets in western society. Nonetheless, the number of studies on insect food products has grown, and it is expected that a need for it will be felt by 2050 (Collins, Vaskou and Kountouris 2019). Insects can be produced with more efficiency than other sources of protein due to less water and land usage as well as reduced necessity for other resources (Dossey and McGill and Tatum 2016). The need for a solution for both climate change and the alteration of biodiversity may lie, according to some opinions, in the usage of these species as a food source. It has been studied and made public that these insects can be transformed into powders, oils, and other substances, thus making it a viable option to substitute not only meats but grains as well.

*Celiac Disease Increase*

Celiac disease is a pathology that started when wheat was introduced into diets. To summarize the condition, when the diseased individual consumes gluten, which can be found in wheat and other grains, their immune system attacks their own tissues (NHS 2022). Throughout the last decades, the number of reported cases of celiac disease has increased by 7.5% per year (Celiac Disease Foundation 2020). This increase can cause a complete shift in the consumption of grains. For example, consumers may trade wheat for gluten-free options such as oats or even corn.

*Starch from CO2*

In an article from the journal “Science”, the Chinese researchers around Cai et al. (2021) present their ground-breaking discovery of how they succeeded in producing starch from CO2 for the first time in the world. Starch is the main component of grain and the most common carbohydrate in the human diet. In addition to its critical role in food production, starch also has important applications in industries such as paper production. Until now, starch has always been extracted from crops. Most of the production is based on corn and potatoes and a small part on wheat. The process developed by the scientists allows CO2 to be converted into starch much more efficiently than plants do. If the costs of the process can be brought down to the same level as agricultural production, the scientists estimate that more than 90 % of the cultivated land and freshwater resources can be saved. The industrialization of the technology would further have a major impact on securing food security and reducing environmental damage caused by fertilizers and pesticides while utilizing CO2 (Lavars 2021).

*Harbours’ Bottleneck*

Directly related to the trend mentioned above, harbours are facing a huge problem which is the bottleneck phenomenon. A bottleneck is a point of congestion in a production system that stops or severely slows the system. The inefficiencies brought about by the bottleneck often create delays and higher production costs (Investopedia 2022).

A container that used to take between 55 and 60 days to be transported along the routes between Europe and Asia before the pandemic now takes an average of 108 days as of January 2022, due to port congestion (Prosertek 2022).This leads to major financial consequences like a rising inflation due to higher operational costs.

*Summer Fires Increase*

In 2022 in Portugal, we observed an increase of 68% in the number of hectares that were burned in forest fires when compared to the previous year (Lusa 2022). If these fires spread even further

in the next years, it is possible that agriculture will suffer an even larger hit than it already has, as it may be impossible to farm, especially in the summer, without expecting the fire to burn down the crops. It is understandable that some techniques used to aid in the farming of hay involve burning the soil, as it helps remove crop residues, but contrary to forest fires, these types of fires are controlled.

*Woke and Cancel Culture*

Nowadays, we live in a world where people are begging to be woke, meaning that people are more aware of social and political issues and injustices. People tend to defend the point of view of minorities more than the point of view of the privileged ones (Future Platform 2022). These situations lead to a condition called “cancel culture”, which is a movement that aims to remove the social status or esteem of a person, company, or place based on an offensive behavior, transgression, or a biased point of view, these means that you will be thrust out of professional or social circles, it can happen in person or throughout social media. Being “canceled” has a high level of impact and sometimes is almost impossible to recover from, so companies or people must be highly aware of their actions as they can change their business or life. A company might lose its clients or suppliers because of being “cancelled”, and a person might lose friends or even professional credibility as a consequence of something they said or an action.

### 4.1.4 Wild Cards

*Life-threatening disease transmitted through grains*

Grains are highly engrained in the diets of most European countries, considering they are a good source of nutrients as well as socially and culturally vital in food production. Thus, the detection of a disease that is spread through grains would significantly alter the diets of many. If a life-threatening disease were to be discovered, there would be a cultural shift towards other sources of nutrients, like vegetables and seeds, that could result in the same effect, demand for

grains would plummet. This would also create an opportunity for new inventions of substitute products such as starch from CO2 or insect-based food.

*Collapse of the Eurozone*

Already struggling to recover from the 2010 financial crisis, Eurozone has been further hit by the Covid pandemic and then another time by the Russian-Ukrainian war. This and the increasingly irreconcilable differences in the economic development between member states could lead to a collapse of the Eurozone.

If the Eurozone collapses, every country will most likely turn back to having their national currency, which will affect trade negatively or positively, depending on the country. Regardless of the currency problem, trades will suffer due to the lack of internal trade agreements permitted and ensured by the EU policy.

*Extreme Rise in Temperatures*

The extreme rise in temperatures, faster and more prominent than expected, would result in the disappearance of cultivable land for farming, translating to a shift in the supply of grains. The complete disappearance of arable land would be caused by a combination of incidents related to rising temperatures, such as fires mixed with the complete shift of conditions. If this were to happen, the only available solution would be the creation of food in laboratories or controlled environments, which would completely alter the supply side of any food source, namely grains.

*Self-Sufficient Countries*

Being a self-sufficient country means that a country is able to produce or make whatever it needs to keep functioning. Being a self-sufficient country has its positives and negatives. Some benefits of being self-sufficient can be, for example, a higher employment rate because there is going to be more work required (Martin Holzbauer 2020). Being self-sufficient also allows local businesses to thrive, mainly because they do not face competition from foreign businesses with bigger economic capacity and a higher market share. Being a self-sufficient country also

has its consequences, for example, the lack of resources, as a country might not be able to produce. By not having a global trading relationship with other businesses and countries, it means that what is produced is more expensive than having these relations and being able to buy less expensive materials.

*State Monopoly of Grain Trade*

A state monopoly of grain trade would mean that the state of a country would own 100% of the national grain trade and would be able to set the price as high as they want, leading to a bigger profit and no competition. Businesses that are related to the grain trade would suffer from this state monopoly as it would mean that they must accept the prices established. A monopoly of grain trade by the state would mean that companies that trade grains would cease to exist as they would not be able to do business. Having a state monopoly could lead to a lack of innovation and a rise in inflation (Kimberly and Amadeo 2021). There would also be the possibility of having a lower quality of business by not having competitors to keep them at their best, to not lose any clients.

### 4.2 Driving Forces

While STEEP and similar frameworks (PEST or PESTLED) are good for generating ideas, they are less suitable as a stand-alone tool for analyzing the contextual environment. Essentially, the problem with using the STEEP taxonomy is that it does not examine the factors that give rise to an understanding of the dynamics of the relationships and interactions among the various drivers of change. Thus, STEEP alone does not provide a means to determine the factors that drive change, namely, driving forces (Burt et al. 2006, 59–60).

To identify the driving forces, the clustering method was utilized. This approach enables the identification of groups of links, resulting in the generation of fewer, higher-level factors that are directly related to the focal issue. In order to ensure the relevance and thoroughness of the connections and groupings, the X team was consulted during the subsequent two steps.

In the first step, it was discussed how the drivers identified in chapter 4.1 Horizon Scanning relate to each other in chronology or cause/effect. By chronology, is meant that the result of one driver depends on the previous reconciliation of another. Whereas by cause/effect, it is meant that the occurrence of the result of one driver has a direct influence on the result of another (Cairns and Wright 2018, 38). The resulting cluster diagram is visible in Figure 2**,** which is visually displaying the relationships between the megatrends, trends, weak signals, and wild cards. The arrows illustrate how the drivers described in the previous phase relate to each other in chronology or cause/effect.

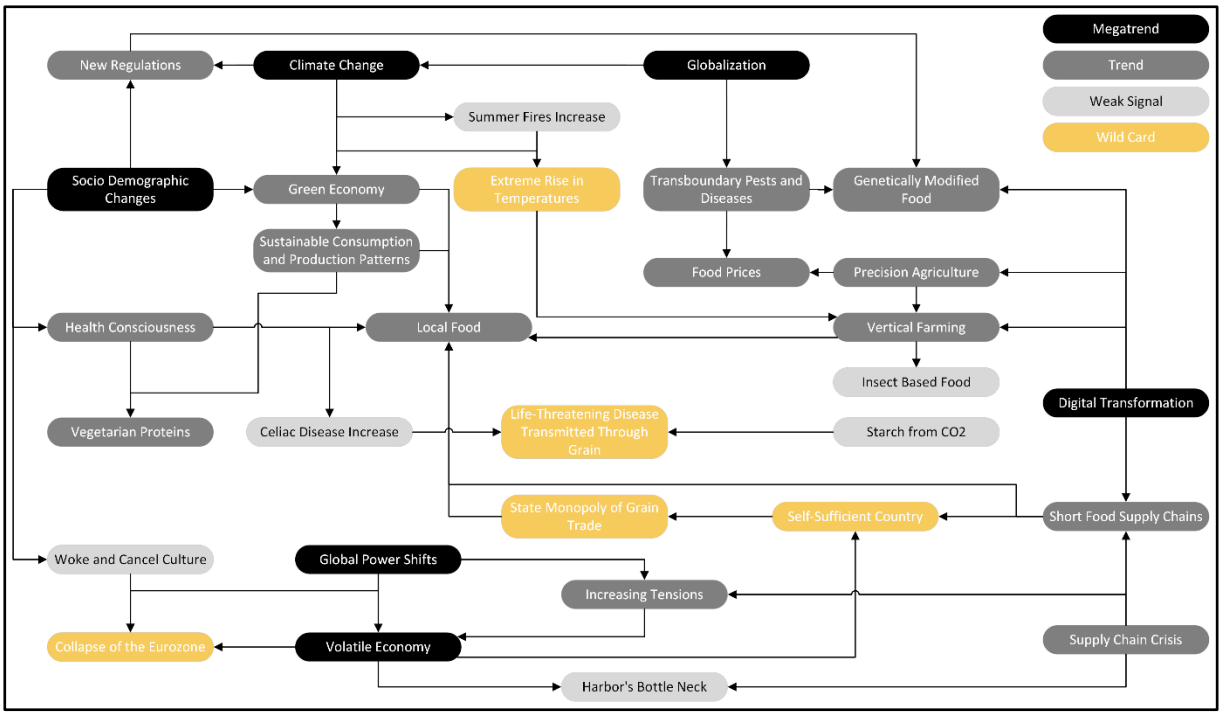


***Figure 2: Cluster Diagram***

In the second step, the resulting clusters were named in terms of higher-level factors (Figure 3), forming the driving forces. In this regard, it is crucial that every driver (would it be a megatrend, trend, weak signal, or wild card) is relevant for the associated driving force. According to the recommendations made by Cairns and Wright (2018, 36), care was taken to formulate the driving forces in as few words as possible but as many words as necessary so they can be easily understood by everybody without further explanation. In addition, there was a need to ensure that the driving forces point to an outcome, distinguishing them from subjects, topics, and

events. However, a specific outcome was never chosen unless it was inevitable (Cairns and Wright 2018, 36). The resulting driving forces are shown in Table 1 in numerical order.

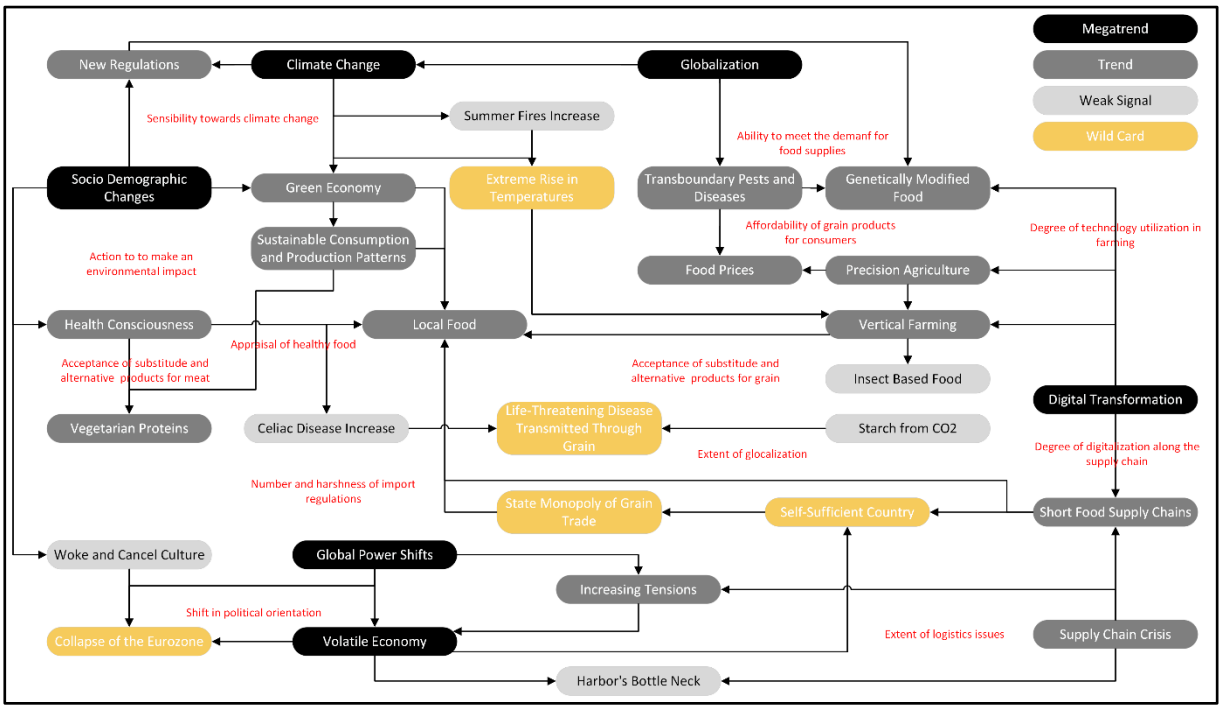


***Figure 3: Cluster Diagram with Driving Forces***

| Number | Driving Forces |
|---|---|
| 1 | Sensibility towards climate change |
| 2 | Degree of technology utilization in farming |
| 3 | Affordability of grain products for consumers |
| 4 | Acceptance of substitute and alternative products to grain |
| 5 | Acceptance of substitute and alternative products for animal protein |
| 6 | Shift in political orientation |
| 7 | Extent of logistics issues |
| 8 | Degree of digitalization along the supply chain |
| 9 | Appraisal of healthy food |
| 10 | Extent of glocalization |
| 11 | Action to make an environmental impact |
| 12 | Ability to meet the demand for food supplies |
| 13 | Strictness of import regulations |

***Table 1: Driving Forces***

### 4.3 Survey Construction using Delphi Statements

The Delphi-method is widely utilized in scenario planning, as it is a key tool to understand experts' opinions on a specified theme (Andersen 2022). Having insight into what specialists believe to be the future is key for any successful plan. Thus, the use of Delphi-statements that should reduce misinterpretations is valuable when choosing the uncertainties to cross in the scenario matrix.

Delphi statements are highly structured brief descriptions of a phenomenon used to collect the respondent's opinion. The core objective of creating Delphi statements is to establish a consensus amongst the specialists questioned. This is derived from a generally similar interpretation of the described information (Salanick, Wegner, and Helfer 2022). The formulated Delphi statements and the questions that usually accompany them are typically utilized to create discussion around the selected topic (Andersen 2022).

In literature, there are different positions about the criteria of Delphi statements, as recommendations differ in their desired length and formulation. However, the majority of authors agree that Delphi statements should be written in simple and concrete language, with the avoidance of technical terminology, slang, and terms that can lead to strong emotions. It is key to avoid compound statements, but the utilization of quantitative terms is highly discussed among scholars. On the one hand, it has been shown that the usage of numbers leads to less ambiguity. On the other hand, studies have also demonstrated that percentages make respondents insecure, leading to a more moderate rating (Markmann et al. 2021). Some additional information should be available in order to ensure that the respondents are knowledgeable. The research subjects should be clearly defined and somewhat knowledgeable on the theme in order to mitigate the anchoring bias (Salancick, Wegner, and Helfer 2022).

The methodological approach described in an article by Czaplicka-Kolarz, et. al. (2009) was used as a basis to guide the development of Delphi statements. In the article, the authors utilize driving forces, amongst other themes, to formulate and divide the statements. Thus, in this study, to achieve a list of Delphi statements that take into consideration the dynamics of the external market, the forces of the industry were used as a foundation. The use of such themes and consequent adaptation of the Delphi-method assures that the statements are relevant and current and assists in understanding how the forces might shape future dynamics. Thus, some

plausible future occurrences were extracted out of the multiple that can be affected by the driving force (Table 2).

| Driving Force | Delphi Number | Delphi Statement |
|---|---|---|
| Sensibility towards climate change | 1 | By 2030, people will believe that their actions have an impact on climate change. |
| Degree of technology utilization in farming | 2 | By 2030, farming processes will be mainly automated. |
| | 3 | By 2030, a significant amount of the food produced for consumption will come from laboratories (e.g., Starch from CO2). |
| Affordability of grain products for consumers | 4 | By 2030, grain products will still be affordable for the large majority of the population. |
| Acceptance of substitute products for grain | 5 | By 2030, many people will accept new substitute and alternative products for grain, like starch from CO2 or insect-based food. |
| Acceptance of substitute products for animal sourced protein | 6 | By 2030, significantly more people will accept substitute and alternative products for animal sourced protein. |
| Shift in political orientation | 7 | By 2030, countries will adapt a highly conservative political orientation. |
| Extent of logistics issues | 8 | By 2030, logistical issues will make it more difficult to meet delivery times. |
| Degree of digitalization along the supply chain | 9 | By 2030, the supply chain will be fully digitalized. |
| Appraisal of healthy food | 10 | By 2030, the consumption of healthy food will increase significantly. |
| Extent of glocalization | 11 | By 2030, people will show strong preference for local food (i.e. food that has travelled only short distances or is marketed directly by the producer). |
| | 12 | By 2030, farmers will be connected with grocers through digital B2B sourcing platforms, eliminating trading companies. |
| Action to make an environmental impact | 13 | By 2030, the amount of vegan and vegetarians in Europe will have increased significantly. |
| | 14 | By 2030, the global meat consumption will decrease significantly. |
| | 15 | By 2030, consumers are willing to spend more money on sustainable food. |
| Ability to meet the demand for food supplies | 16 | By 2030, the demand for food supplies will be higher than the supply. |
| Strictness of import regulations | 17 | By 2030, the strictness of import regulations will increase, making cross border trade more difficult. |

***Table 2: Delphi Statements***

Using the list of Delphi statements, a survey was created, asking respondents to rate the impact of each phenomenon and the probability of its occurrence. The purpose of the study was to

understand the dynamics of the market and the opinions of experts on the future of the industry, within the framed issue and time horizon. Subsequently, after understanding the impact and unpredictability of each of these statements, the driving force with which the chosen ones are connected will be used to create the scenario matrix. Thus, it was important to reach a consensus between the specialists in order to design the scenarios.

The questionnaire was answered by 10 out of the 13 people that currently work for X. These will be mentioned as specialists. To further understand their opinions, a comment section was added to each Delphi statement as well as a video, of our creation, at the start of the survey to ensure the specialists were not led astray when evaluating uncertainty (see Appendix 7).

# 5 Phase III: Synthesize

The third phase – synthesize – aims to select the main driving forces affecting the company's business and environment and identify those uncertainties classifies as critical (high impact and high uncertainty level), with the help of a survey compiled by X's employees.

The two uncertainties found to have the greatest impact and the greatest level of uncertainty are subsequently selected to develop the Scenario Matrix - four scenarios resulting from the combination of different configurations of the two uncertainties.

## 5.1 Impact/Uncertainty Matrix

As mentioned before, the survey was meant to assess the specialists about the statements regarding the future of the business, where they had to rate the developed Delphi statements in two different situations: level of uncertainty and level of impact on the business/company. The survey's main objective is to reach common ground among the specialists to lay the way for the scenarios' categorization and later, the scenario construction. Each statement was evaluated on a scale from one to ten, from a low level of uncertainty to a high level of uncertainty and from a low level of impact to a high level of impact. After analyzing the different answers from the

specialists according to their level of impact and uncertainty (Appendix 8), the uncertainty/impact matrix, shown in Figure 4 was extracted.

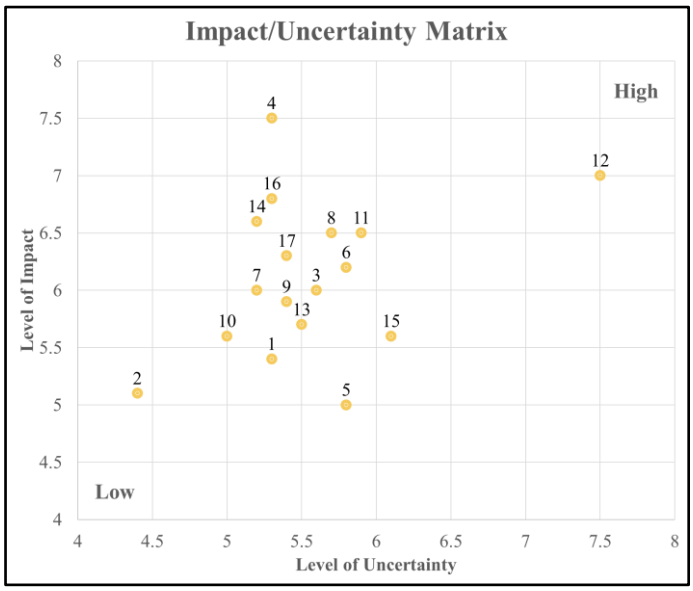


***Figure 4: Impact/Uncertainty Matrix***

### 5.1.1 Key Uncertainties

After obtaining the uncertainty/impact matrix, focus was drawn on distinguishing the driving forces with the higher levels of impact and uncertainty from the rest. This procedure aims to identify the driving forces that should be used as a base for the scenario configuration. These high-impact, high-uncertainty driving forces are referred to as key uncertainties (also critical uncertainties) and can be found in the yellow quadrant in Figure 5. It is important that these key uncertainties are sufficiently independent from each other (Cairns and Wright 2018, 44). Therefore, it was tested for each key uncertainty, whether its two contrasting resolutions could plausibly coexist with the others in the future. Since Delphi statement 11 and 12 both measure the driving force “extend of regionalization”, they were combined into one key uncertainty. This results in a total of four key uncertainties, which could be used for the formation of the scenario. Namely, these are: “extent of regionalization”, “acceptance of substitute and alternative products for meat”, “extent of logistics issues” and “degree of technology utilization in farming”.

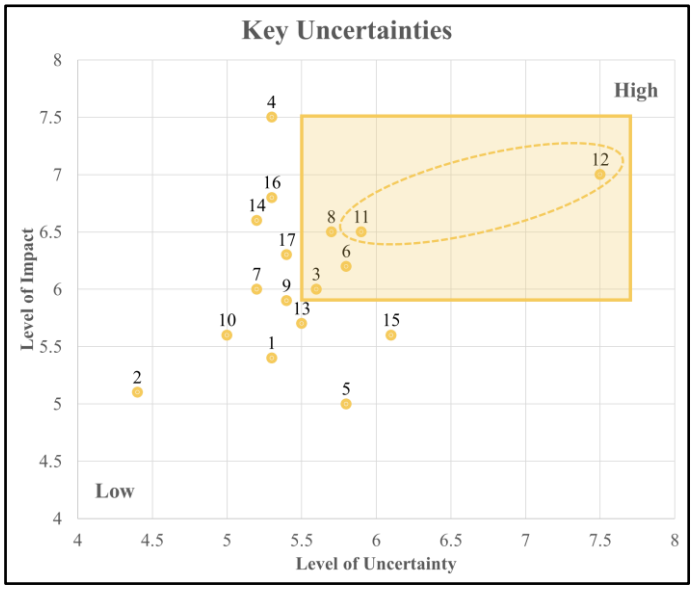


***Figure 5: Key Uncertainties***

### 5.1.2 Pre-determined Elements

Pre-determined elements are those whose occurrence is almost guaranteed, but the way they will interact with other variables is uncertain. According to Pierre Wack (1985), they are events that have already happened but whose outcomes are yet to be witnessed. Consequently, these elements are characterized by low uncertainty and, to be of any significance, must have a high impact on the industry within which X is inserted.

In the impact-uncertainty matrix, some Delphi statements may seem to fit the definition of pre-determined elements, low uncertainty and high impact, but the understanding that the level of uncertainty can be low due to justified suspicion that the event will not occur rules them out.

When it comes to Delphi statement number 4, “Grain products will still be affordable to a large majority of the population in 2030”, it can be taken as a pre-determined element. Despite the growing prices of grains and cereals, these are still considered a relatively cheap commodity and are hence within the means of the majority of the population. Accordingly, the maintained affordability of grains will be considered certain for the continuation of this study.

The new Common Agricultural Policy (CAP) should also be added as a pre-determined element. Despite its current existence, which is aligned with the definition of these elements, its interaction with the factors that will be studied is uncertain. The CAP has been the active

policy linked to agriculture in the European Union for the last four decades and has suffered several reforms. The new CAP was signed in 2021 and will be effective from 2023 until 2030. It is vital to understand how its policies on price support, control of supply, payments to farmers, and border measures would impact the different scenarios. Thus, the new regulations and their implications must be studied within each scenario.

To summarize, the pre-determined elements going forward will be the maintained affordability of grains and the Common Agricultural Policy.

### 5.2 Key Uncertainties Configurations

For each of the identified four key uncertainties, several possible highly contrasting outcomes, which could possibly arise from them over the chosen time frame of seven years, were discussed. In the following, they are described as two contrasted and challenging configurations that are still plausible and therefore possible (Cairns and Wright 2018, 40). Figure 6 summarizes the configurations of the four key uncertainties, which are explained in more detail in the following.

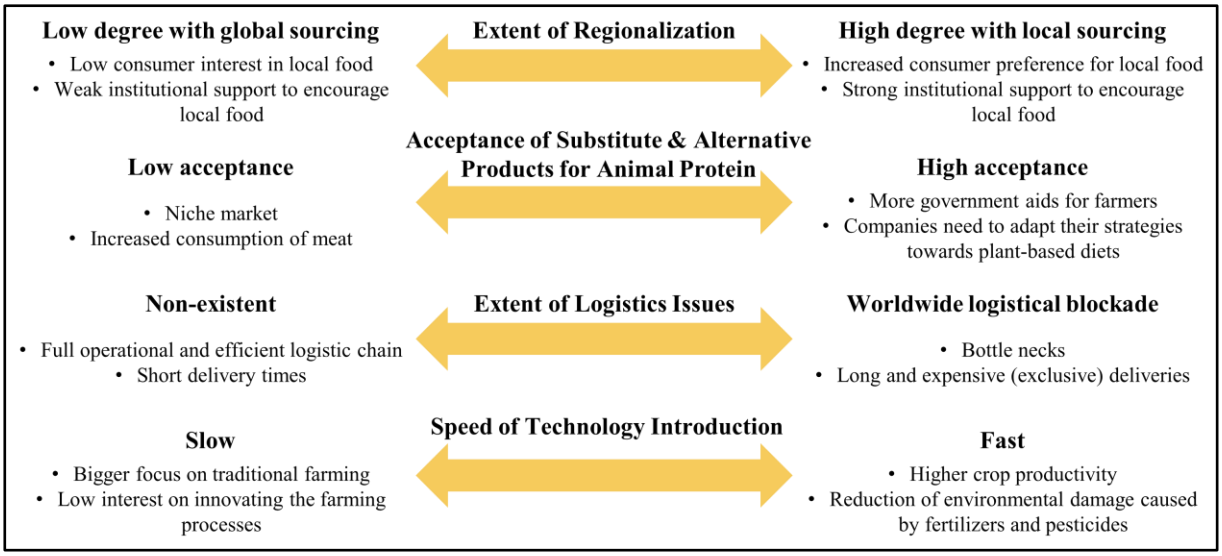


***Figure 6: Key Uncertainties Configurations***

*Extent of Regionalization*

The first key uncertainty, "Extent of Regionalization" addresses the question of how important local food will be for future customers and which role digital B2B sourcing platforms will have in connecting local farmers with grocers and customers to provide locally sourced food.

While globalization has led to increased interdependencies in the world, shifting agricultural production to countries where it can be done at the lowest costs, the Russian-Ukrainian war has shown how fragile this system can be. As Ukraine is one of the world's major grain producers, a halt of exports due to Russia's blockade would have severe consequences for global food security (Eisele 2022). By promoting local cultivation, this dependence could be reduced in the future. However, this depends heavily on institutional support, which must either heavily subsidize domestic production or impose high import tariffs on foreign agricultural products.

Due to the great uncertainty about where the future food will come from, the two outcomes were designated as "global" and "local". Global means that the extent of regionalization is low, and the international cultivation and exchange of agricultural products will continue to advance. Local means that the extent of regionalization is high, moving the cultivation of agricultural products inland.

*Acceptance of Substitute and Alternative Products for Animal Protein*

Related to Delphi statement number 6 we have the driving force "Acceptance of Substitute and Alternative Products for Animal Protein". We are able to form a clear connection between this force and the number of existing vegetarians and non-meat eaters, which can be taken as a challenge as well as an opportunity for X.

Vegetarians and non-meat regimens represent an important share of food consumption, at least in the last decade. Thus a conclusion that companies should adapt to the emerging diets can be drawn, as they can translate to new possible customers. To sustain a healthy lifestyle, when foregoing meat, vegetarians, and vegans must find a replacement for the lack of proteins. Some

grains and pulses, such as lentils and beans, are rich in protein. Thus, the new potential use of X's product can be an opening in the market to elevate its standing. Despite the growing market, it is important to note that a large portion of the population does not believe these can effectively substitute meat.

One possible outcome of this driving force is "low acceptance" where the percentage of people who believe grains to be substitutes for animal protein is small, making it a niche market. On the other hand, we have "high acceptance" where the market for non-animal protein is extensive and warrants the adaptation of X's strategies.

*Extent of Logistics Issues*

The driving force "Extent of Logistics Issues" is related to the Delphi statement number 8, which states: "By 2030, logistical issues will make it more difficult to meet delivery times". Directly related to the supply chain crisis' trend, it refers to the challenges businesses handling products face, especially at an international level.

After the COVID-19 pandemic, logistical issues started to arise and affect different industries. These issues are mainly related to the labor and shipping shortage, which led to significant delivery delays and, consequently, higher costs for the company that ordered the transport or handled it. Logistical issues are visible worldwide. For example, at the gates of the world's largest ports, cargo ships are waiting daily to enter and unload the goods they are transporting (Plimmer and Dempsey 2021). But the problem does not only concern transport by sea but also by land due to the labor shortage, resulting in a vicious circle. The question is: will the situation improve? This is why we are facing an uncertainty.

The two extreme answers to this question are: no, it will get worse and there will be a total and worldwide logistical blockade (worst case scenario, maximum extent of logistics issues); or yes, and the logistical problems will no longer be so (best case scenario, minimum extent of logistics issues).

*Speed of technology introduction*

One of the key uncertainties is the speed of technology introduction in farming, more specifically, the speed in which food produced for consumption will come from laboratories, as is the case in the starch from CO2. The possibilities for using starch from CO2 are endless, and it has important applications as it has a critical role in food production but also impacts paper production. The process used by scientists allows for CO2 to be converted into starch more efficiently than from plants (Lavars 2021; Cai et al. 2021).

When classifying the key uncertainties, one needs to focus on the extreme cases, meaning the extreme cases of the speed of technology introduction in farming. In these situations, the extreme cases are the low speed of technology introduction and the high speed of introduction of technology in farming. In the situation of low speed of technology introduction in farming, more traditional farming will be experienced, meaning that farmers will remain or even reduce the technology level they already have. This will maintain the current processes that are already used, leaving almost no room for innovations that can be brought from the usage of technology. On the other hand, a higher speed of technology introduction in farming could lead to higher crop productivity, meaning a reduction in costs that, in consequence, can save up to 90% (ninety percent) of the cultivated land and water resources. It can also lead to a major impact when referring to securing food and reducing the environmental damage caused by fertilizers and pesticides (Lavars 2021).

### 5.3 Scenario Construction

For the scenario construction, a deductive approach using two of the earlier identified key uncertainties in a 2x2 matrix was applied. Therefore, two key uncertainties among all the proposed ones have been selected. The successive phase aims to identify the plausible scenarios X could face in the future. In order to do that, the first step consists of analyzing these key uncertainties and combining them by using different configurations. The result will be four

forecasted scenarios from which strategies will be developed to aid the company in its future endeavors.

These four scenarios will be represented using the Ansoff matrix. Created by the American planning expert Igor Ansoff, it is a planning tool that links an organization's marketing strategy with its general strategic direction. Even if it has been initially used as a marketing tool to identify plausible entry-market strategies, it can be readopted as a strategic planning tool to analyze future scenarios, presenting four of them in the form of a 2x2 table or matrix (Ecobici 2017).

In accordance with the method chosen to create scenarios, it was necessary to reduce the four identified key uncertainties to two. For this purpose, all possible two combinations of key uncertainties were evaluated, and potential scenarios were explored. X was consulted to ensure that the scenarios contained topics that were as relevant to the company as possible. In the end, a combination of the two most critically ranked key uncertainties turned out to be the most productive scenarios. Accordingly, the key uncertainties used for scenario building are "Extent of Regionalization" and "Acceptance of Substitute and alternative Products for Animal Protein". The first one also arises naturally from the selected focal issue, while the latter results from X's request to deal with the substitution of animal protein for plant protein in more detail. Using the two key uncertainties and their configurations in combination with the pre-determined elements allows the creation of four contrasting scenarios. The aim was to create plausible narratives about the future that are easily understood yet compelling enough to stimulate new thinking. To do so, as well as to make the scenarios more tangible, personas were used to identify the typical behavior of the consumers in the different scenarios. As shown in Figure 7, catchy names were developed for each scenario that can be easily remembered and help to get a good idea about the scenario. The objective of the whole exercise is not to develop four stories, one of which will materialize and become true, but to increase sensitivity and

awareness that the actual future will not be one of the four scenarios but will incorporate elements from all of them. Therefore, the recommendations of many experts were followed, according to which one should avoid assigning probabilities to the respective stories and refrain from defining a most likely future (Garvin and Levesque 2006, 6).

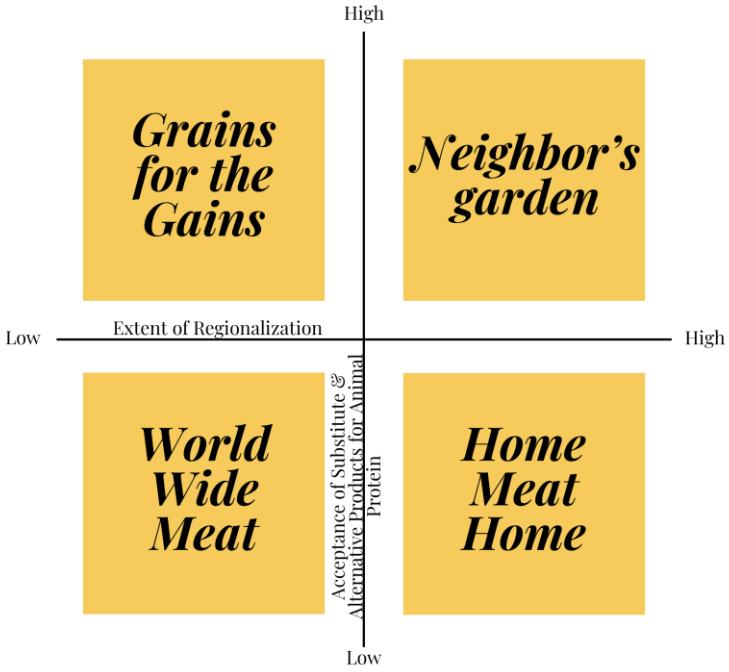


***Figure 7: Scenario Matrix***

### 5.4 Strategic Analysis Methodology

A guideline consisting of four steps combining different frameworks was developed for the strategic analysis of the scenarios. The guideline incorporates different recommendations made in the literature, standardizing the analysis of all scenarios to ensure the comparability of the strategic recommendations. This is particularly important, as chapter 5.6 Plausible Scenarios represents the individual group members' contribution to this master's thesis.

In the first step, the external opportunities and threats resulting from the respective scenarios are highlighted. Combined with the developed scenarios, this provides a comprehensive picture of the potential macroenvironment.

In the second step, Tapinos' (2012, 341–43) recommendation is followed to incorporate an analysis of X's internal environment for the development of a holistic strategy for each scenario.

He proposes to use the VRIO framework developed by J. B. Barney (1995) to identify the resources and capabilities that give X a sustainable competitive advantage. Before examining whether X's resources and capabilities contributing to the competitive advantage will remain sustainable in each scenario a general VRIO analysis is conducted in chapter 5.5 VRIO Analysis**.**

In the third step, the external and internal analysis results are used to develop strategic recommendations. These are tailored to the specific characteristics of the scenarios and are designed to help X respond quickly when it is apparent that a particular scenario is likely to materialize (Garvin and Levesque 2006, 7).

After reviewing the recommendations within each scenario, it is important to characterize them in strategic terms to better understand the path to their creation. To meet this requirement, in step four, an Ansoff matrix is produced to make the positioning of the recommendations visible. As the name indicates, the Ansoff matrix was first presented by H. Igor Ansoff, and it is a known strategy to assess the attractiveness of different expansion approaches. For management teams, the grid helps conceptualize the amount of investment and risk associated with the growth initiative, as the four boxes represent different levels of these factors. The axis focuses on the two sides of any strategy, the product, and the market. The products can either be ones already present in the portfolio of the company or new items within the organization. The market can be one the institution is already present in or a new one (Meldrum and Mcdonald 1995).

From the two options within the axes come four different configurations: Market penetration, product development, market development, and lastly, diversification. Market penetration consists in the addition of new growth strategies within the pre-existing market utilising the traditional products portfolio. It is characterized by the lowest risk in all the boxes, as both the environment and the materials are familiar to the company. These strategies also involve the

least amount of investment, as there are no R&D expenses. On the other hand, product development is characterized by doing business in the existing market with new products. This type of strategy requires a lot of investment in R&D. Thus, it can be considered quite risky. Market development is the use of existing products while expanding to new markets. This type of tactic involves less risk than the previous because it requires less investment in R&D. Despite this, there is still a considerable amount of vital research regarding the new environments. Lastly, diversification is known to be the riskiest approach, as neither the environment nor the materials are recognizable within the institution. Additionally, it requires a lot of investment in R&D which increases risk.

### 5.5 VRIO Analysis

The VRIO framework developed by J. B. Barney (1995) was used to identify the resources and capabilities that give X a sustained competitive advantage. With the help of these core organizational resources, further reflections can be made on how they can be leveraged in a meaningful way by X to create new growth opportunities.

In the first step, all the potential key resources and capabilities were identified. According to the definition, these include all assets, capabilities, organizational processes, firm attributes, information, and knowledge that a firm control and enable it to improve its efficiency and effectiveness (J. Barney 1991, 206). For X, these are industry knowledge, customer relationship management, operational risk management, tax management, product portfolio, financial capacity, local presence in Portugal, position in ports, certifications, and community relations.

In the second step, the resources and capabilities were accessed based on four attributes that are determinants of sustained competitive advantage. These attributes are also the ones that gave rise to the framework's name, which is an acronym of valuable (V), rare (R), inimitable (I), and organized (O). Each resource must therefore face the question of whether it is valuable, rare, inimitable, and organized. Only if all attributes apply to a resource or capability it has the

potential to provide a sustainable competitive advantage. However, this does not mean that a resource that does not meet all the conditions is unimportant. In the following, the individual attributes and what it means when a resource fulfills them are discussed in more detail.

*Valuable*

A resource or capability is valuable when it enables the company to exploit opportunities and/or neutralize threats. The company has potential for a competitive disadvantage if this prerequisite is not met. The company can only achieve competitive parity if a resource or capacity is valuable but neither rare nor inimitable.

*Rare*

A resource or capability is rare when only one or a few companies possess it. When a resource or capability is both valuable and rare, the organization has a resource with potential for a temporary competitive advantage.

*Inimitable*

A resource or capability is inimitable when firms without it face a cost disadvantage in obtaining it compared to firms that already possess it, as they are hard and costly to imitate or substitute. When a resource or capability is valuable, rare, and inimitable, the organization has a resource with potential for unused competitive advantage.

*Organized*

Only if a resource is valuable, rare, inimitable, and organized it can provide the organization with a sustainable competitive advantage. The question of organization relates to a company's structure, systems, and policies. These components are complementary resources because they alone have little ability to create a competitive advantage. However, it's only possible to realize a full competitive advantage if these complementary resources enable the other resources to exploit potential (J. B. Barney 1995).

In the following X's resources and capabilities were accessed based on the VRIO framework. An overview of the results can be seen in Table 5. Besides highlighting the resources and capabilities that give X a sustainable competitive advantage, the classification can be used to identify resources and capabilities that have potential for improvement. However, it must be mentioned that there are resources that, by nature, cannot fulfill all attributes (J. B. Barney 1995, 52).

| X's Resource Platform | V | R | I | O | Competitive Implications |
|---|---|---|---|---|---|
| Resources | | | | | |
| Product portfolio | ✓ | | | ✓ | Competitive parity |
| Financial capacity | ✓ | ✓ | ✓ | ✓ | Sustainable competitive advantage |
| Local presence in Portugal | ✓ | ✓ | | ✓ | Temporary competitive advantage |
| Strong positioning in Protuguese ports | ✓ | ✓ | ✓ | ✓ | Sustainable competitive advantage |
| Certifications | ✓ | ✓ | | ✓ | Temporary competitive advantage |
| Stakeholder relations | ✓ | ✓ | ✓ | ✓ | Sustainable competitive advantage |
| Capabilities | | | | | |
| Industry knowledge | ✓ | ✓ | | ✓ | Temporary competitive advantage |
| Customer relationship management | ✓ | | | ✓ | Competitive parity |
| Operational risk management | ✓ | | | ✓ | Competitive parity |
| Tax management | ✓ | ✓ | ✓ | ✓ | Sustainable competitive advantage |

***Table 3: VRIO Analysis***

*Competitive parity*

X's product portfolio, operational risk management, and customer relationship management only allow it to achieve competitive parity as both resources are valuable and organized; however, they lack in rareness and are easy to imitate by competitors. Many retailers use operational risk management by applying back-to-back trading and buying credit insurance. According to X, there is still room for improvement in negotiating and declaring COSEC costs. Many competitors also offer a product portfolio similar to X's. Here it is important to adapt the product portfolio constantly so that it is as easy as possible for customers to obtain all the products they need from a single source. This would allow X to at least achieve a temporary competitive advantage as the unique product portfolio is rare. Concerning customer relationship management, the flow of information between X and its customers is still done by e-mail and

telephone. To avoid a competitive disadvantage, introducing a CRM system is vital for X (evaluation within the organization is taking place).

*Temporary competitive advantage*

X's local presence, customer-oriented certifications, and industry knowledge are a source of temporary competitive advantage. Being valuable rare, and organized, the only thing that lacks is that they are not inimitable. X's local presence in Portugal is an advantage over its multinational counterparts. However, the existence of several national distributors makes this resource only conditionally rare. X's various certifications, which among others, confirm its adoption of sustainability policies throughout the value chain, are an order winner in relation to the competition. Therefore, the resource is rare but not inimitable as competitors can also obtain these certificates. For this reason, X needs to keep the pioneering role by constantly updating its certificates. Industry knowledge refers to the knowledge captured in human capital. Due to the high competitiveness of the Portuguese labor market as stated by X, this resource is rare. Special training measures for younger people can increase this resource to address the retirement of older employees.

*Sustainable competitive advantage*

The sources for X's sustainable competitive advantage were identified to be its financial capacity, strong positioning in Portuguese ports, community relations, and tax management. As part of the RAR group, X has a strong financial capacity, enabling the company to receive cash on favorable terms. This is important because commodity trading provides only very small margins and therefore, slightly better conditions with the banks are decisive for the success of a business. The strong position in the Portuguese ports has been built up through years of relationships and trading of large volumes, making it difficult for competitors to imitate this resource. Stakeholder relations refer to the existing relationships with suppliers, customers, and the community. X enjoys high upstream and downstream credibility, which is complemented

by its flexibility. Together with numerous partnerships such as universities, associations, and consortia, X has an exclusive network that is unique in its form. The integration of X into the RAR group allows the company to benefit from a special system of tax incentives for business R&D.

### 5.6 Plausible Scenarios

In the following, four contrasting scenarios were developed. The aim was to create plausible narratives about the future that are easily understood, yet compelling enough to stimulate new thinking. The objective of this exercise is not to develop four stories, one of which will materialize and become true, but to increase sensitivity and awareness that the actual future will not be one of the four scenarios but will incorporate elements from all of them. Therefore, the recommendations of many experts were followed, according to which one should avoid assigning probabilities to the respective stories and refrain from defining a most likely future (Garvin and Levesque 2006, 6).

The creation of each scenario is followed by a strategic analysis, which enables the formulation of strategic recommendations for the corresponding scenario. To reach a final conclusion, these recommendations are then organized using the Ansoff Matrix.

### 5.7 Scenario: Grains for the Gains

The name of the scenario, “Grains for the Gains” results from the configuration of the two key uncertainties: low degree of regionalization with global sourcing and high acceptance of substitute and alternative products for animal protein.

In this scenario, the global integration of supply chains is expanding, paving the way for more transnational trade relations. To ensure supply security, the procurement network has shifted towards diversification. Rather than relying on a few countries that produce a significant proportion of the grain for the world market, the focus has moved to source from a wider variety of countries. Russia’s war in Ukraine has fueled this development, as has the increase in extreme weather conditions that have led to more and more crop failures.

In order to increase crop yields and thus ensure global food security, developed countries have released agricultural subsidies and increased their funding to support agriculture in less developed countries significantly. In the EU, efforts to strengthen the resilience of the agricultural sector are supported by policy reforms under the new CAP. As the CAP's first objective is to ensure a fair income for farmers, the EU member states have improved the targeting of support measures (European Commission 2022).

Due to the improved income conditions for farmers and the increased prices for agricultural products, farming has become profitable again for many smaller producers making some countries produce a surplus. As growing conditions and specialization in agricultural products vary across countries, and customers demand a diverse range of products throughout the year, cross-border trade of agricultural products has seen significant growth. Consumers are grateful for the variety of globally produced food due to its lower price compared to most locally produced food. In fact, consumers are highly sensitive to prices, as food prices have risen sharply in the considered time horizon. This increase in food prices is the result of growing demand coupled with a moderate increase in supply. The increased demand can be attributed to the growth of the world's population, which increased from 7.94 bil in 2022 to 8.55 bil in

2030, representing a 7.7% increase (UN 2022). At the same time, the inability to increase supply at the same pace as demand can be attributed to deteriorating growing conditions resulting from climate change. Nevertheless, grain products remain affordable for the majority of the population.

Further, the noticeable impacts of climate change in the form of persistent droughts and floods has caused many consumers to change their behavior. Consumers are placing a higher emphasis on pursuing a sustainable lifestyle making their diets more environmentally friendly. As most consumers are aware that the greenhouse gas produced by livestock farming contributes significantly to global warming, they buy less meat and more plant-based products. Also, ethical concerns about the welfare of farm animals play an ever-greater role in the consumption decisions of many people. This development was further reinforced when the European Parliament decided to introduce a tax on animal products according to the request of the organization "True Animal Protein Price Coalition" (TAPPC) (Vergeer et al. 2020). The earnings from this tax are used to reduce VAT on the production of healthy plant foods, such as pulses, fruits, and vegetables (Leite Pinto 2021, 121).

As a result of these developments and an increased awareness of healthy lifestyles, a significant portion of the population follows a flexitarian, vegetarian, or vegan diet. Accordingly, the consumption of meat and other animal proteins has declined sharply. Vegetables with high protein content are increasingly in demand for direct human consumption. Many people use substitutes to replace meat, fish, eggs, and dairy products to meet their protein needs. As part of the dietary change, all major consumer goods companies offer a wide range of products replacing animal protein with plant-based protein. New producers have established themselves on the market with innovative products that better imitate the taste and texture of animal products. This includes products made from cultured meat that has been produced by culturing animal cells in vitro (Ben-Arye et al. 2020). The masses gladly accept these substitute and

alternative products to animal protein due to their excellent taste and quality, which facilitated the switch to a diet containing less or no animal protein for many people. Besides innovation, the market for animal protein substitutes is driven by price competition, as private labels offer many low-cost alternatives to branded products.

Furthermore, consumers use more international ingredients to add variety to their meat-free diets. Inspiration for this is primarily drawn from vegan food blogs, social media apps, and food shows on streaming services. Through their digitality, these sources of inspiration have no boundaries, making the global eating culture more uniform. Especially recipes for preparing vegetable proteins are increasing in demand. Thus, the Israelian and Indian cuisines, which offer many of these alternatives, have gained more popularity.

To make the scenario more tangible, in the following the daily life in this scenario is illustrated using a persona. Maria is a married mother of two children in her 30ies. She works part-time, taking primary responsibility for the household. She emphasizes a healthy and environmentally friendly diet for her entire family. Therefore, she almost exclusively buys vegan products. The wide variety of high-quality and good-tasting meat substitutes made it easy for her entire family to adopt a vegan diet. As Maria is very time constraint with her job and household commitments, she goes to a large supermarket chain twice a week. She values the convenience of supermarkets because they offer a wide selection of vegan products in one place. This makes her shopping quick and convenient. Supermarkets also offer many healthy and vegan products that are easy to prepare, saving her time for cooking during the busy weekdays.

Consequently, she rarely goes to local stores and farmers' markets as these lack in terms of convenience, offered product range, and prices. Her budget for food is relatively low, so she is price sensitive and mainly buys private labels. A large selection of vegan food from private labels offers a good alternative to brand products. On weekends, Maria likes to devote more time to cooking and trying out new vegan recipes from around the world. Many specialty food

items, such as lentils and beans, that used to be available only in specialty stores, can now be found in many supermarkets.

*Strategic Analysis*

A strategic analysis of the scenario "Grains for the Gains" is performed to develop strategic recommendations. This analysis aims at assessing the scenario's impact on X's external and internal environment.

For the external analysis, the opportunities and threats resulting from the scenario were identified and summarized in Table 4.

| | Opportunities | Threaths |
|---|---|---|
| External Environment | O1.**Higher demand for plant-based proteins** due to changed societal values (increased environmental call to action and concerns of animal welfare) and meat tax<br>O2.**New customer segments** like CPG companies and pet food manufacturers can be supplied with cereals and plant-based proteins<br>O3.**New supplier countries** | T1.**Low demand for feed grain** due to decreased consumption of meat and other animal proteins<br>T2.**Loss of economies of scale** due to lower volumes traded (poor freight rates compared to larger competitors) |

***Table 4: Opportunities and Threats – Grains for the Gains***

Based on the integrated approach proposed by Tapinos (2012), the strategic analysis of the scenario is broadened through an internal analysis in order to examine the impact of the scenario "Grains for the Gains" on the internal environment. To do so, the additional strategic analysis introduced in chapter 5.5 VRIO Analysis is utilized, where the most important resources and capabilities have already been identified. This part examines whether the resources and capabilities that contribute to the competitive advantage will remain sustainable in the scenario "Grains for the Gains". For this purpose, the VRIO analysis is repeated, assuming the occurrence of the scenario while the internal capabilities and resources are not changing.

Accordingly, Table 5 shows which of the existing strengths will remain and which will become parities or disadvantages (Tapinos 2012, 342–43).

| X's Resource Platform | Current | | | | | Grains for the Gains | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | V | R | I | O | Comp. Implication | V | R | I | O | Comp. Implication |
| Resources | | | | | | | | | | |
| Product portfolio | ✓ | | | ✓ | Comp. parity | | | | | Comp. Disadv. |
| Financial capacity | ✓ | ✓ | ✓ | ✓ | Sust. comp. adv. | ✓ | ✓ | ✓ | ✓ | Sust. comp. adv. |
| Local presence in Portugal | ✓ | ✓ | | ✓ | Temp. comp. adv. | ✓ | ✓ | | ✓ | Temp. comp. adv. |
| Strong positioning in Protuguese ports | ✓ | ✓ | ✓ | ✓ | Sust. comp. adv. | | | | | Comp. Disadv. |
| Certifications | ✓ | ✓ | | ✓ | Temp. comp. adv. | ✓ | | | ✓ | Comp. parity |
| Stakeholder relations | ✓ | ✓ | ✓ | ✓ | Sust. comp. adv. | | | | | Comp. Disadv. |
| Capabilities | | | | | | | | | | |
| Industry knowledge | ✓ | ✓ | | ✓ | Temp. comp. adv. | | | | | Comp. Disadv. |
| Customer relationship management | ✓ | | | ✓ | Comp. parity | ✓ | | | ✓ | Comp. parity |
| Operational risk management | ✓ | | | ✓ | Comp. parity | ✓ | | | ✓ | Comp. parity |
| Tax management | ✓ | ✓ | ✓ | ✓ | Sust. comp. adv. | ✓ | ✓ | ✓ | ✓ | Sust. comp. adv. |

***Table 5: VRIO – Grains for the Gains***

From the re-performed VRIO analysis for the “Grains for the Gains” scenario, five retain their current potential out of the ten capabilities and resources identified. X’s financial capacity and tax management continue to offer potential for sustainable competitive advantage, the local presence in Portugal offers potential for temporary competitive advantage, and customer relationship management, as well as operational risk management, keep potential for competitive parity. Correspondingly, the scenario "Grains for the Gains" does not affect these resources as they are independent of the respective external influences.

The situation is different for those resources and capabilities where certain attributes (valuable, rare, inimitable, organized) are no longer fulfilled. In the scenario, X is facing degradation of its resource product portfolio from competitive parity to competitive disadvantage, as the resource stays only conditionally valuable in a market where less feed grain is demanded. This is particularly concerning as it affects the conditional value of other resources and capabilities. For example, the decreased demand for grain in the compound feed industry would negatively impact X’s strong position in Portuguese ports, as lower trade volumes reduce presence in ports resulting in worse terms. Thus, a former competitive advantage would turn into a competitive disadvantage. Additionally, the company's stakeholder relations and industry knowledge, which

were previously valuable, are less relevant in the scenario since a large part is oriented toward the feed grain industry. As a result, X may face challenges in exploiting opportunities and neutralizing risks in the market. Furthermore, the temporary competitive advantage achieved through certifications is likely to be reduced as competitors also become certified to meet the increasing environmental awareness of consumers.

*Strategic Recommendations*

After analyzing X's external and internal environment, it is possible to provide strategic recommendations to improve and leverage core resources and capabilities to respond to environmental opportunities while neutralizing external threats (Barney 1991, 204). For X, this results in the four strategic recommendations: (1) expand product portfolio with kidney beans, (2) diversify procurement network, (3) source kidney beans from Argentina and Canada, and (4) extend and develop customer base in industries for alternative products to animal proteins. The following section provides a more detailed elaboration of the strategic recommendations.

*Recommendation 1: Expand product portfolio with kidney beans*

Based on the strategic analysis of the "Grains for the Gains" scenario, the strategic recommendation for X is to expand its product portfolio. The market for which X imports grain is composed of compound feed production as well as the milling industry. Until now, X has been heavily dependent on the compound feed industry, which accounts for about 70% of imports. However, the market for feed grain will shrink considerably in this scenario as the consumption of animal proteins such as meat, eggs, and milk will decline. Increased consumer awareness of sustainable consumption patterns requires a change in the strategic alignment of X's product portfolio. If, for example, the European Parliament follows the recommendation of the TAPPC to introduce a meat tax, X will be impacted negatively. This proposal suggests implementing a meat tax on beef, pork, and chicken meat at the following rates: €4.77 per kg of beef, €3.61 per kg of pork, and €1.73 per kg of chicken meat. Ultimately this would result in

a reduction in consumption of 67% for beef, 57% for pork and 30% for chicken (Vergeer et al. 2020). This decline in meat consumption will have a one-to-one impact on the demand for compound feed. In such a shrinking market, it is difficult for X to meet its targets of doubling the EBITDA to €2.4 mil by 2030 compared to 2021 without expanding its product portfolio. However, the question arises as to which products are particularly suitable for this. The key factor to consider in this scenario is the potential for growth in demand for the products and the strategic value of adding them to X's existing portfolio.

To adapt to current market trends and capitalize on growth opportunities, X should consider trading pulses and oilseeds to expand its product portfolio. This would enable the company to better align its offerings with market demand and position itself for success. While the scenario implies that the market for compound feed will shrink, the market for plant-based proteins will experience significant growth. On the one hand, this is due to the increased consumer acceptance of alternative and substitute products to animal protein and, on the other hand, to the sharp decline in meat consumption. Accordingly, in this scenario, the majority of the population's protein needs will be met by plant-based proteins. Among common vegetable foods, oil-bearing crops and pulses have the highest protein content. For example, soybeans (oil-bearing) contain 36.8% of protein and raw lentils (pulses) 23.8%, while beef contains only 15.8% (Grigg 1995, 2). Furthermore, many oilseeds and pulses are highly nutritious and offer opportunities for further processing into food products, such as meat substitutes (Chéreau et al. 2016, 5). Accordingly, the proportion of oilseeds and pulses in our diets will increase substantially. This will be achieved through both the unprocessed and processed use of these raw materials (Euromonitor 2021).

The best way for X to enter the pulse market is through the import of kidney beans (also referred to as common dry beans) to Portugal. The trade of kidney beans offers X an ideal opportunity to leverage its key resources and capabilities. Initially, kidney beans stand out due to their large

trade volume compared to the trade volume of other pulses (see Appendix 3). Thus, the national import market for pulses in 2021 amounted to almost 65 thsnd tons. Kidney beans account for the largest share with 42 thsnd tons (66%), followed by chickpeas with 11 thsnd tons (16%). One potential advantage of trading kidney beans, which are typically transported in bulk by sea and land to the agrifood industry, is that it would allow X to leverage its existing industry knowledge in trade, logistics, and food safety. This could enable the company to efficiently and effectively manage its operations in this new product category.

Further, the origin of kidney beans is partly the same as those of the cereals and their byproducts, which Axembex already markets. Finally, X could have a competitive advantage in terms of logistical costs due to its relationship with various Portuguese ports and port operators, high import volumes, and storage capacities.

*Recommendation 2: Diversify procurement network*

X should further diversify its procurement network across several countries. This can reduce the country risk of delivery failures and ensure a continuous delivery capacity. Particularly with regard to the data on harvest reliability, this is particularly important as it is expected that harvests will continue to fluctuate in the future due to climate change and the associated increase in extreme weather conditions (IPCC 2018). If crop failures increase in a specific region and the procurement network is not diversified, it may be challenging to continue providing adequate supplies

In addition to climate change, other country-specific risks can affect supply security. For example, the Russian-Ukrainian war temporarily jeopardized the ability to supply wheat (Eisele 2022). The trade dispute between the EU and the USA has also led to the introduction of import duties on certain agricultural products from the USA, which in turn has made the import of many of these products unattractive, and they could be obtained more cheaply from other countries (ITA 2021). Therefore, it is important to be able to rely on a broad network of

suppliers in various countries with whom a good relationship has already been established. To maintain a reliable supply of goods, it is crucial for X to diversify its sourcing network.

*Recommendation 3: Source kidney beans from Argentina and Canada*

In order to enter into the import of pulses, X should first import kidney beans from Argentina and Canada. Due to their large production volumes, both countries are among the largest exporters of kidney beans. This can also be seen in Portugal's import volumes. In 2021, with 24.6 thsnd tons, the highest volume of kidney beans was imported from Argentina, followed by Canada with 8.8 thsnd tons (Appendix 5). This is mainly due to the lower prices for kidney beans from Argentina. The approximate price range for Canadian kidney beans in 2022 is between USD 0.93 and USD 0.95 per kilogram, while Argentine beans are priced at USD 0.84 (Selina Wamucii 2022a; Selina Wamucii 2022b). However, importing from Canada offers significant advantages compared to Argentina. Canadian producers enjoy an excellent reputation for reliably supplying high-quality common dry beans in large quantities. In contrast, Argentina is less reliable due to increased economic instability, export taxes, and a lack of quality seed use (CBI 2022a; Levinson 2019). However, the price remains the main decision criterion for most Portuguese customers. In order to serve the price-sensitive segment on the one hand and the quality-conscious segment on the other, it is crucial to establish trade relations with Argentina and Canada. These can be used in the subsequent course for the import of other types of pulses.

*Recommendation 4: Extend and develop customer base in industries for alternative products to animal proteins*

X should extend and develop its customer base by entering additional associations and exploring new customer segments. This is essential in order to sell the newly traded products, increase sales and reduce dependence on the limited number of customers. These efforts will also strengthen X’s stakeholder relations, creating potential for sustainable competitive advantage.

In order to benefit from the growing demand for meat substitutes, X should focus its customer acquisition efforts on food manufacturers and ingredient companies that produce alternative products to animal proteins. The increased offerings of established and emerging companies provide versatile opportunities for X as a supplier. In the market for alternative products to animal proteins, X could excel with its existing product portfolio and, upon expansion, particularly with pulses. In addition to pulses, various types of cereals are also used to improve the consistency of meat substitutes (Curtain and Grafenauer 2019, 6; Kumar et al. 2017, 925–27). By offering many of the needed raw materials, X facilitates procurement for companies in the market for alternative products to animal proteins. With its extensive experience in the import of food products and wide range of certifications, X is well positioned to be considered as a supplier for food manufacturers and ingredient companies that produce alternative products to animal proteins.

To attract new customers and strengthen existing relationships with food manufacturers, X should intensify its presence at trade fairs and explore new connections to associations. For example, attending the "Food Ingredients Europe" trade show offers a good opportunity to meet companies in the food ingredients industry looking for new suppliers. These companies are particularly desirable customers as they like to outsource the import of raw materials to experienced importers and focus on the development of innovative ingredients (CBI 2022a). Furthermore, associations and confederations can help build connections with customers and other key players along the supply chain. For example, X can explore prospective buyers among the members of the "European Vegetable Protein Association" or "The Global Pulse Confederation" (CBI 2022a; CBI 2022b). Furthermore, X should deepen and develop existing customer relationships. By considering specific customer needs, X can expand the range of products supplied and increase the volume of trade. For example, the existing trading relationship with Nestlé offers an excellent opportunity to sell additional products and increase

the order volumes of products already purchased. X currently supplies Nestlé's Alvanca factory with barley and rye. However, Nestlé also sells a variety of meat substitutes in Portugal under the name Garden Gourmet (Euromonitor 2022). This presents X with the opportunity to position itself as a supplier of the raw materials needed by Nestlé to manufacture products for its vegan line.

*Ansoff Matrix*

To better understand the risk and investment requirements that go along with the adaption of the four strategic recommendations made, the Ansoff matrix was applied to categorize them (Table 6). Risk increases each time one moves into a new quadrant, either horizontally or vertically (Meldrum and Mcdonald 1995).

| | | PRODUCTS | |
|---|---|---|---|
| | | Existing | New |
| MARKETS | Existing | **Market penetration:** None | **Product development:** Rec. 1+3+4: Expand product portfolio with kidney beans from Argentina and Canada to better serve current customers |
| | New | **Market development:** Rec. 2+4: Diversify procurement network and develop customer base in industries for alternative products to animal proteins | **Diversification:** Rec. 1+2+3+4: Source kidney beans from Argentina and Canada and develop customer base in industries for alternative products to animal proteins |

***Table 6: Ansoff Matrix – Grains for the Gains***

Accordingly, market penetration has the lowest risk. However, none of the recommendations fall into this category due to the low growth potential such a strategy offers in the given scenario, as the existing market is already heavily saturated with existing products.

Product development is inherently more risky, but also holds the potential for significant rewards. Recommendations 1, 3, and 4 particularly pertain to this endeavor. By expanding its

product portfolio to include kidney beans from Argentina and Canada, X would be able to better serve its existing customers and thus increase its trading volume with them.

Market development encompasses recommendations 2 and 4. By diversifying its sourcing network for existing products and targeting new industries for alternative protein sources, X would be able to create growth opportunities with relatively little risk. However, gaining access to these markets may be difficult without expanding its product portfolio, limiting growth potential.

By implementing all of the strategic recommendations, X can achieve complete diversification. The introduction of new products into a new market offers the greatest prospects for success in this scenario. By expanding its product portfolio to include pulses and oilseeds and diversifying its sourcing network, X will be able to attract new customers, particularly in industries seeking alternative protein sources. Even though this strategy is the riskiest in terms of the capital required, it pays off with exceptionally high growth opportunities.

*Conclusion*

Given the declining demand from the compound feed industry, it is impossible for X to achieve its goal of doubling its EBITDA by 2030 in the scenario “Grains for the Gains”, if the strategy is not adapted adequately. By applying all four strategic recommendations, X can improve its resource platform, enabling it to benefit from the changed market conditions this scenario entails.

# 6 Phase IV: Global Recommendations

Some recommendations were composed as a preemptive measure to ensure that X is prepared for the eventuality of any of the previously described scenarios or a mix of several.

These proposals are designed to be robust in a variety of potential futures, while still aligning with growth strategies. These recommendations include expanding the product portfolio to include soy and kidney beans, increasing the number of clients, and establishing relationships with vegetarian lines.

*Recommendation 1: Add soy beans to product portfolio*

The general strategic recommendation for the product portfolio expansion is that X should enter the soybean trade. This can be explained by the fact that both configurations of the key uncertainty, "Acceptance of substitutes and alternative products for animal protein" are advantageous for the trade of soybeans. On the one hand, soybeans are the basis of many substitutes for animal protein and can be used to generate bovine skeletal muscle tissue for cell-based meat (Ben-Arye et al. 2020). On the other hand, they find a large market in animal feed production due to their high protein content. For instance, about 77% of the global soybean production is used to produce animal feed. The majority of soybeans processed to soy cake are used in poultry farming (37%), followed by pig farming (20.2%) (Fraanje, Garnett, and Breewood 2020). In Portugal alone, demand for soybeans (excluding soy cake) grew at a CAGR of 7.1% between 2019 and 2021, bringing soybean imports to more than 1.4 mil tons in 2021 (see appendix 5). This is equivalent to about 36% of total grain imports. By trading soybeans in high volumes, X can leverage its key resources and capabilities to offer additional commodities to its existing customers in the compound feed industry. However, X can also benefit from trading soybeans as the acceptance of plant-based substitutes increases. In this case, demand from the feed industry would decrease, but new opportunities would arise in processing as a substitute for animal proteins. Soy is not only the basis for tofu, soy milk, and

tempeh but also for various meat substitutes such as vegan sausages, burgers, and mince (Curtain and Grafenauer 2019, 4–6). Here, soy protein is particularly attractive due to its high nutritional quality and processing ability. This is why it is already the most widely used vegetable protein in manufacturing meat substitute products (Chéreau et al. 2016). Therefore, soy is a good entry product for X to position itself as a supplier for the meat substitute industry. The overlap in production regions for soybeans, pulses, and cereals suggests that incorporating these items into the product range can help to ensure a steady supply and diversify the offerings of X. In particular, incorporating soybeans into the product portfolio can be beneficial due to their wide range of applications. Soybeans can be used as animal feed in regional livestock farming and as a substitute for animal protein, making them a valuable addition to the product range. More than 80% of the world's soybeans are produced in Brazil, the United States, and Argentina (Kuepper and Stravens 2022, 5), making these countries important sources for this product.

*Recommendation 2: Add kidney beans to the product portfolio*

Kidney beans are a popular source of protein for vegetarians looking for plant-based options that are easy to prepare and integrate into their diets. This type of bean is also familiar in many different cultures, so people accustomed to alternative protein diets are often already familiar with cooking them. Incorporating kidney beans into the product range can also help X establish relationships with vegetarian lines that use beans as a source of protein in their meals.

Additionally, there are also some typical dishes in Portuguese cuisine that use kidney beans as an ingredient, such as feijoada. It is also important to note that kidney beans, or rice with beans, can be considered a side dish. Consequently, its addition to X’s product portfolio should be profitable even without facing an increasing acceptance of substitute and alternative products for animal protein.

*Recommendation 3: Increase number of customers*

To prevent the danger of having too much business centered on a limited number of clients, X should diversify and expand its customer base. There are several approaches to implementing this advice, two of which are particularly promising.

Firstly, there is a need to look at the market and understand which direction to follow in order to look for new customers that meet the internal rules defined by the company. The main rule is that the new customer is financially healthy, meaning that X should analyze the liquidity, solvency, profitability, and operating efficiency (Maverick 2022) to understand if the customer will pay the correct amount on time.

Secondly, X can increase its customer base by implementing an inbound marketing strategy. This strategy focuses on creating and sharing valuable information with potential customers in order to attract them to the company. By demonstrating its superior service and competitive prices, X can effectively differentiate itself from its competitors and attract new customers. In addition, inbound marketing can facilitate the process of increasing the number of customers and diversifying the company's customer base. This, in turn, can help to reduce the risk of relying too heavily on a small number of customers.

*Recommendation 4: Relationship with vegetarian lines*

In response to the growing popularity of plant-based diets, major multinational companies such as Nestlé, Nobre, and Iglo are expanding their portfolios to include alternative protein sources. This shift reflects the increasing demand for plant-based protein among consumers and represents an effort by these companies to meet this demand.

As these multinational corporations offer a variety of products, such as vegetarian nuggets, hamburgers, and sausages, they need a variety of raw materials. Consequently, the creation of alternative protein source lines can be presented as an opening for grain-trading companies, as

many of these products are based on grains and pulses, such as lentils, beans, soy, wheat, and others.

While X could begin commercializing other sources of protein, such as beans and soy, as presented in the other recommendations, in the meantime, the company could try to create agreements and partnerships with the multinationals for cereals. The firm may already be considered an incumbent in the wheat trading business and thus has the advantage of a preceding reputation when making these arrangements. It would also be helpful to create relationships with businesses that are expanding their portfolio to create an opening for beans and soy when they start being marketed. X will have more leverage at the negotiating table with wheat, but it creates a pre-existing relationship when they wish to begin selling other sources of protein.

It is important to note the present association that X has with Nestlé. This link presents an open channel to discuss the wheat supply for their vegetarian line “Garden Gourmet” under which plant-based alternatives are marketed.

Creating these relationships with the different brands would increase the client portfolio for X and help the company cater to the new market characteristics.

# 7 Phase V: Monitor – Early Indicators

In order to prepare for the uncertain future, which could be one of the four scenarios or a mix of some of them, X should monitor specific early indicators. An early indicator is measured data that shows in which direction a predicted subject is heading (Reiff 2022). Thus, it is possible to adopt early indicators to predict, or at least have a perception, of how the future will evolve and consequently adapt the strategy following the suggested recommendations (Rosenberg 2019). Undeniably, being prepared to face a scenario is one of the biggest components in the future success of the company.

*Extent of Regionalization*

In order to gaze in which direction the future is heading when it comes to regionalization, X should monitor some early indicators. These factors are namely: counter-urbanization, the ratio between the waiting time before and after implementing the digital platform, and lastly, the ratio between imports and consumption.

Counter-urbanization is data that is easily retrievable from studies periodically run by governments. Urbanization is a phenomenon directly related to globalization. The reverse process will show the population's trend to go against it and turn "back to the origin". This would be facilitated by the fact that nowadays and especially in the future remote working will be a central concern of each company. Therefore, workers will not need to live in the city where their company is based but can work wherever they want, even in the most rural town of the country. All they need is an internet connection. In that case, local food will be preferred and even easier to access since big supermarket chains will have a lover influence, favoring small grocery shops.

The ratio between the waiting time before and after implementing the digital platform is an indicator that can easily show how X and its clients are adapting to the newly implemented digital platform. From the customer's point of view, it will show X if there is an increase in satisfaction by being able to offer solutions faster than before. These will be helpful to increase the number of clients, locally or internationally. For X, this ratio is an important indicator as it will show if there is an increase in efficiency when dealing with customers and their problems.

Lastly, it is important to mention the ratio between imports and consumption, as it shows if customers are searching for international or national products. If imports decrease, but consumption remains constant, it would indicate that people are more willing to eat national products. On the other hand, if imports increase and consumption remains constant, it shows that consumers are looking for international products rather than national products. In order to

understand this ratio X should recall national statistics, that can be found on INE (Instituto Nacional de Estatística) website. This will allow X to draw conclusions and adapt the chosen strategy to achieve the best results possible.

*Acceptance of substitute and alternative products for animal protein*

To better understand the direction the future is heading towards when it comes to the acceptance of substitutes and alternative products for animal protein, some key early indicators must be kept in mind. These are explicitly: the development of the demand of feed grain versus grains for consumption, the meat consumption compared with the vastity of vegans' and vegetarians' population, and the increase in the portfolio of vegetarian product lines.

The development of the demand of feed grain versus grains for consumption is an indicator that will define the main focus of X, as it can completely change the direction the company should follow. In case the demand for feed grain, intended for cattle, increases while the one attached to grains for consumption decreases or remains equal this entails that the meat business is still growing and thus substitute products must not be highly accepted.

Meat consumption is another key point, but it has to be compared with the vastity of the vegan and vegetarian population. Truly, if meat consumption increases while the number of people on alternative protein diets decreases, it means that more people are maintaining a traditional diet based on animal protein. On the other hand, if their population doesn't change, it would only mean that people eating meat are eating more, and that would not indicate that there is less acceptance of substitutive animal protein products.

Lastly, the extent of the portfolio of vegetarian lines can indicate whether the demand for these is high or low. Currently, a number of companies are adding vegetarian lines as part of their new strategy, and thus, the behavior of these pursuits will indicate the profitability and, subsequently, the demand for these products.

# 8 Conclusion

In summary, X should not make drastic changes to the structure and the characteristics of its strategic decisions but should implement partial changes to ensure that they are prepared for one of the four described scenarios or a combination of some of them. After the internal and external environment scanning, as well as the survey and meeting sessions with X, it is possible to conclude that the company will have to face some transformational processes with the goal of keeping its competitive advantage in a fast-changing environment.

The current grain market is suffering changes, from the more traditional animal-sourced proteins towards alternative and substitute sources, like lentils and beans, for example. The increase in demand for these alternative products is forcing organizations to restructure in order to respond to the new demand. For decades, the grain industry has been relatively stable but, as of late, there has been a shift in both the demand and supply. The evolving trends have shaped consumer preferences, thus forcing companies to expand their portfolios. Additionally, climate change and other disruptions have altered the supply chain of this type of industry.

The scenario development process was designed with the goal of challenging X perspective towards the future of the company and the market, as well as the conventional thinking, which allows for a change in the way business is done, serving as a stress test for the current strategy. Furthermore, it allows X to improve and strengthen their decision-making processes, which is possible from the obtained global recommendations, which were worked from the scenarios and meeting sessions.

The global recommendations for X consist in the addition of soy and kidney beans to the product portfolio, as an alternative for animal-sourced protein products and the increase in the number of clients, with the goal of diversifying risk. In addition, it is also recommended that X starts a relationship with vegetarian lines, with the goal of increasing the product and client portfolios.

# 9 Limitations

Although detailed care was taken in both the research and development phases of the plausible scenarios, when analyzing the content of this research, it should not be forgotten that it contains inherent limitations in the concept of strategic foresight and scenario planning.

Starting from the fact that this science, and even more so the Intuitive-Logics School methodological approach, is based on the concept of uncertainty, it must be taken into account that there is no single plausible future. Still, there is a multitude of plausible scenarios that may highly differ from one another. Given the vast number of scenarios, it would be impossible to map them all and provide a precise strategy for each one.

Another assumption on which scenarios are based is that *"the development of scenarios involves both rational analysis and subjective judgment, they therefore require interactive and participative methods"* (Berkhout and Hertin 2002). The subjective element is a fundamental part, but it could lead to erroneous considerations dictated by various factors, such as a lack of expertise on the subject under study, and that’s another significant limitation of this research.

Finally, the Intuitive-Logics School is regarded as the most effective and appropriate method of using any possible information about the future and can be very helpful when generating new ideas and identifying underlying patterns (Mietzer 2005).

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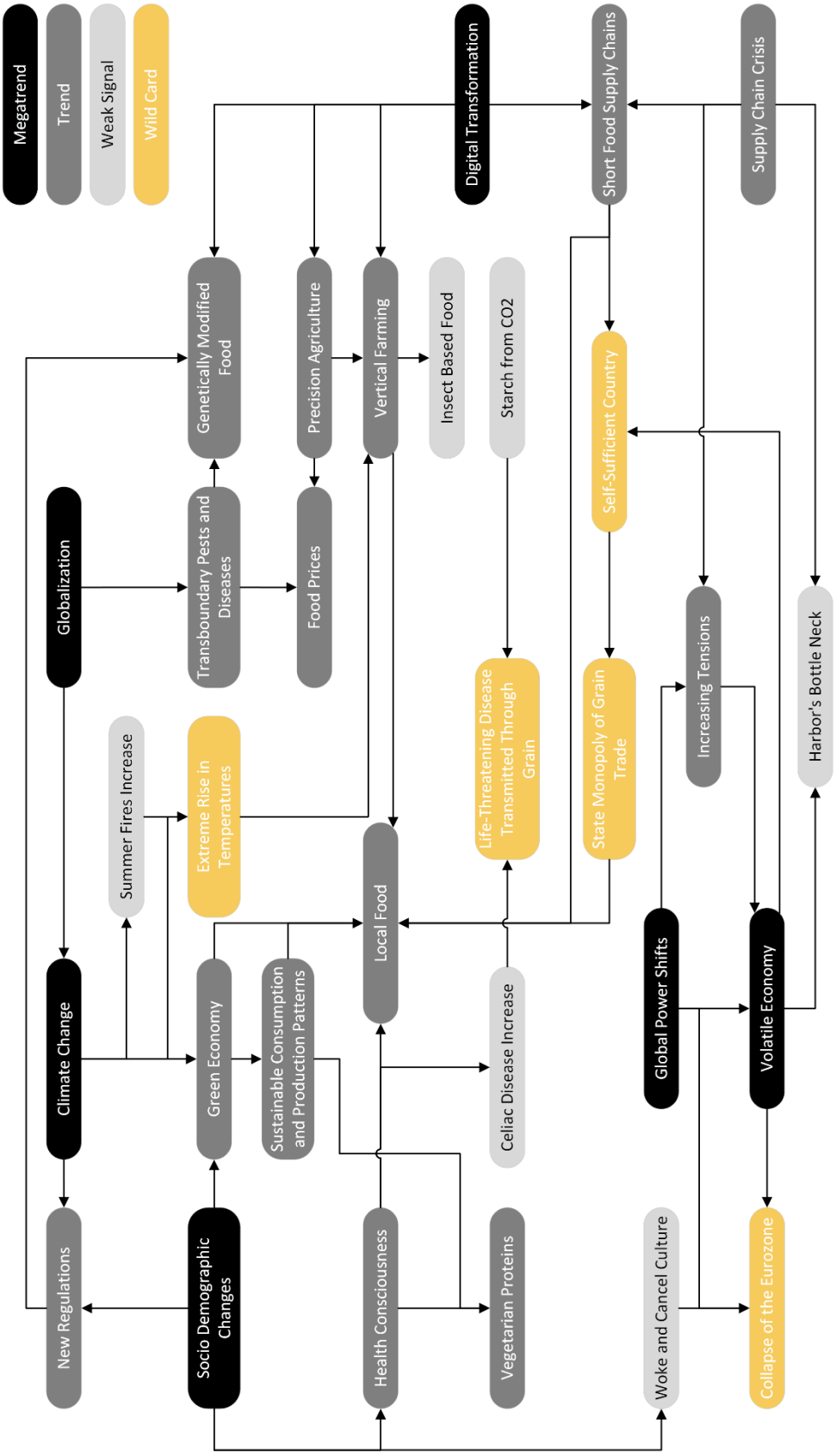
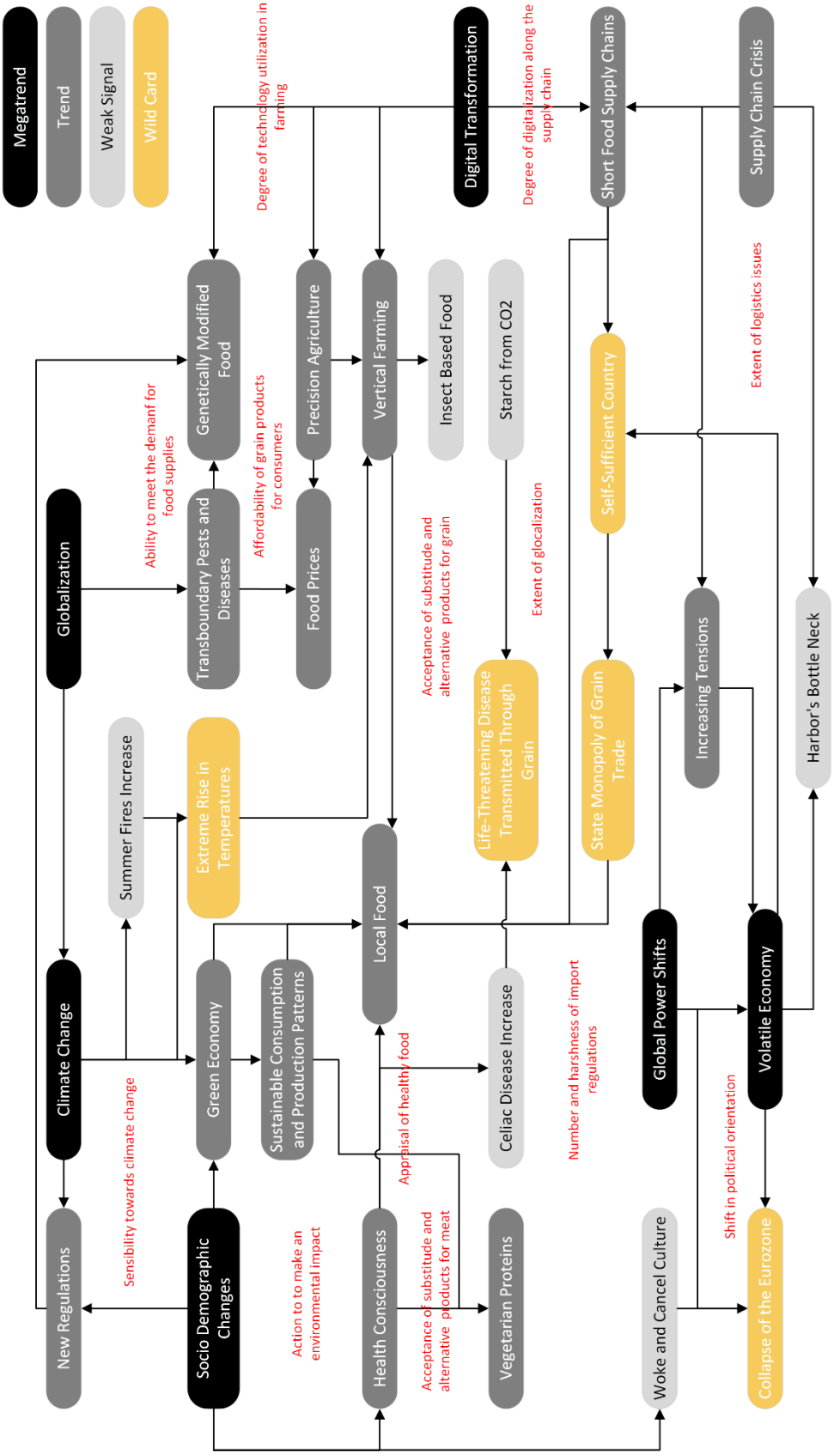
# Appendix

## Appendix 1: Cluster Diagram without Driving Forces



## Appendix 2: Cluster Diagram with Driving Forces



## Appendix 3: Portuguese import market for pulses, soja beans and cereals in tons

| HS-Code | Product Description | Tonnes/year 2019 | 2020 | 2021 | CAGR 2019-2021 |
|---|---|---|---|---|---|
| 713 | Dried leguminous vegetables, shelled, whether or not skinned or split | | | | |
| 71310 | Peas (Pisum sativum) | 4,825 | 5,367 | 5,159 | 2% |
| 71320 | Chickpeas (garbanzos) | 41,572 | 20,011 | 10,535 | -37% |
| 71331 | Beans of the species Vigna mungo (L.) Hepper or Vigna radiata (L.) Wilczek | 136 | 162 | 137 | 0% |
| 71332 | Small red (Adzuki) beans (Phaseolus or Vigna angularis) | 305 | 283 | 25 | -56% |
| 71333 | Kidney beans, including white pea beans (Phaseolus vulgaris) | 34,552 | 35,409 | 42,637 | 7% |
| 71335 | Cow Peas (Vigna unguiculata) | 2,359 | 2,692 | 2,119 | -4% |
| 71339 | Other, 71339 | 343 | 853 | 402 | 5% |
| 71340 | Lentils | 1,532 | 1,649 | 2,056 | 10% |
| 71350 | Broad beans (Vicia faba var. major) and horse beans (Vicia faba var. equina, Vicia faba var. minor) | 1,666 | 1,606 | 1,658 | 0% |
| 71360 | Pigeon Peas (Cajanus cajan) | 161 | 333 | 28 | -44% |
| 71390 | Other, 71390 | 30 | 38 | 169 | 78% |
| | **Sum dried leguminous vegetables, shelled, whether or not skinned or split** | **87,481** | **68,403** | **64,925** | **-9%** |
| 12 | Oilseeds | | | | |
| 1201 | Soya beans, whether or not broken | 1,137,719 | 1,392,051 | 1,410,533 | 7% |
| 10 | Cereals | | | | |
| 1001 | Wheat and meslin* | 1,351,200 | 1,201,724 | 1,184,079 | -4% |
| 1002 | Rye | 23,434 | 20,072 | 37,425 | 17% |
| 1003 | Barley** | 345,739 | 365,616 | 392,743 | 4% |
| 1004 | Oats | 9,208 | 16,867 | 19,025 | 27% |
| 1005 | Maize (corn) | 2,133,584 | 1,899,506 | 2,080,273 | -1% |
| 1006 | Rice | 183,794 | 219,581 | 161,030 | -4% |
| 1007 | Grain sorghum** | 5,486 | 7,020 | 5,932 | 3% |
| 1008 | Buckwheat, millet and canary seeds; other cereals | 10,952 | 35,627 | 46,041 | 61% |
| 100850 | Quinoa (Chenopodium Quinoa) | 334 | 389 | 352 | 2% |
| | **Sum Cereals** | **4,063,397** | **3,766,013** | **3,926,550** | **-1%** |

Sources: WITS (2022)
*Data for 2019 and 2021, Access2Markets (2022)
**Data for 2021, Access2Markets (2022)

## Appendix 4: Portuguese import market for pulses, soja beans and cereals in USD

| HS-Code | Product Description | Trade Value in 1,000 USD 2019 | 2020 | 2021 | CAGR 2019-2021 |
|---|---|---|---|---|---|
| 713 | Dried leguminous vegetables, shelled, whether or not skinned or split | | | | |
| 71310 | Peas (Pisum sativum) | 3,354 | 3,344 | 3,589 | 2% |
| 71320 | Chickpeas (garbanzos) | 28,949 | 14,145 | 8,267 | -34% |
| 71331 | Beans of the species Vigna mungo (L.) Hepper or Vigna radiata (L.) Wilczek | 169 | 207 | 203 | 6% |
| 71332 | Small red (Adzuki) beans (Phaseolus or Vigna angularis) | 420 | 446 | 54 | -49% |
| 71333 | Kidney beans, including white pea beans (Phaseolus vulgaris) | 32,111 | 36,004 | 49,361 | 15% |
| 71335 | Cow Peas (Vigna unguiculata) | 1,598 | 2,463 | 2,544 | 17% |
| 71339 | Other, 71339 | 376 | 778 | 414 | 3% |
| 71340 | Lentils | 1,045 | 1,390 | 1,867 | 21% |
| 71350 | Broad beans (Vicia faba var. major) and horse beans (Vicia faba var. equina, Vicia faba var. minor) | 963 | 892 | 954 | 0% |
| 71360 | Pigeon Peas (Cajanus cajan) | 153 | 273 | 34 | -40% |
| 71390 | Other, 71390 | 128 | 82 | 300 | 33% |
| | **Sum dried leguminous vegetables, shelled, whether or not skinned or split** | **69,285** | **60,023** | **67,586** | -1% |
| 12 | Oilseeds | | | | |
| 1201 | Soya beans, whether or not broken | 426,158 | 532,015 | 669,683 | 16% |
| 10 | Cereals | | | | |
| 1001 | Wheat and meslin* | 296,617 | 291,637 | 358,385 | 7% |
| 1002 | Rye | 4,868 | 4,185 | 9,700 | 26% |
| 1003 | Barley** | 70,459 | 75,611 | 105,770 | 15% |
| 1004 | Oats | 2,621 | 4,687 | 6,205 | 33% |
| 1005 | Maize (corn) | 414,141 | 378,830 | 509,404 | 7% |
| 1006 | Rice | 95,074 | 112,083 | 96,876 | 1% |
| 1007 | Grain sorghum** | 1,549 | 1,809 | 1,893 | 7% |
| 1008 | Buckwheat, millet and canary seeds; other cereals | 6,568 | 12,927 | 16,628 | 36% |
| 100850 | Quinoa (Chenopodium Quinoa) | 1,048 | 1,218 | 1,133 | 3% |
| | **Sum Cereals** | **891,898** | **881,769** | **1,104,860** | 7% |

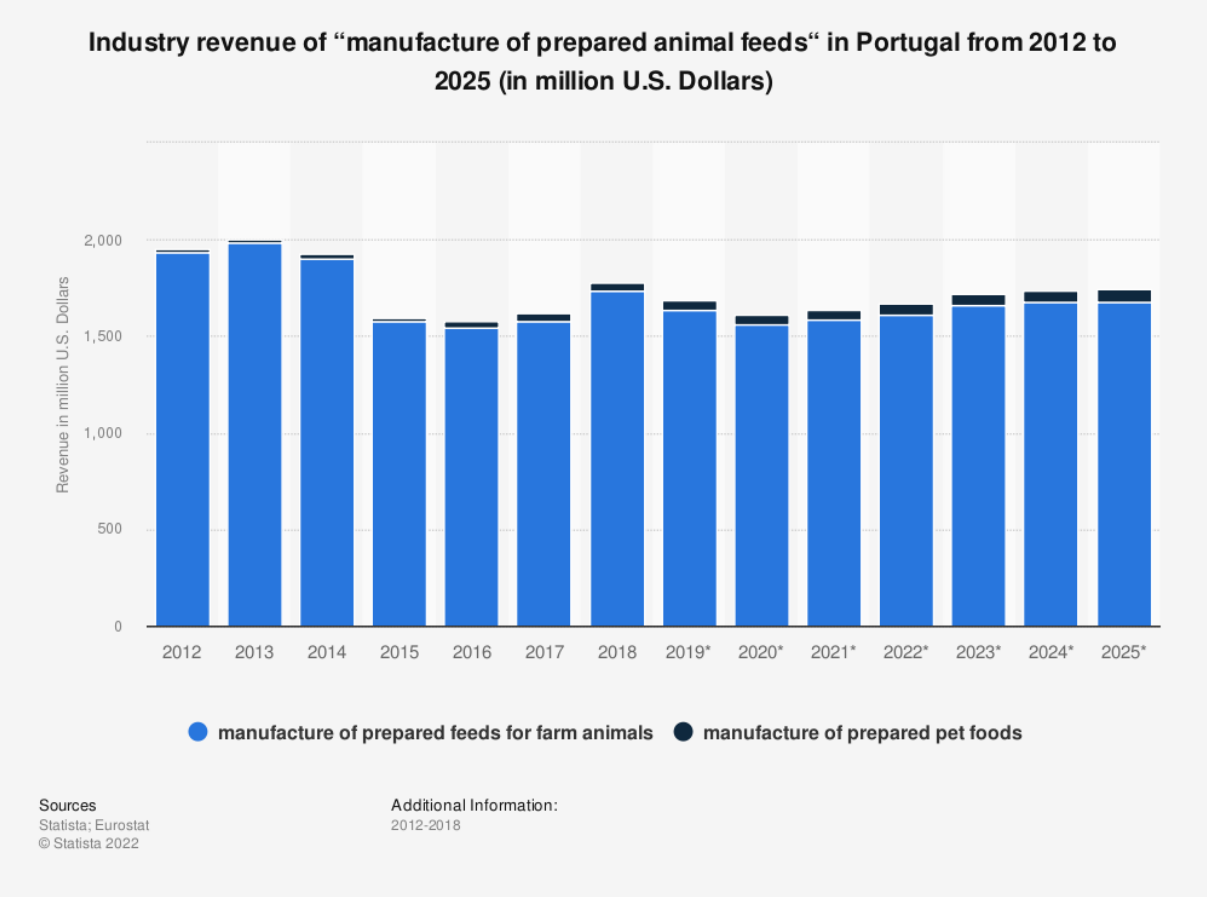
Sources: WITS (2022)

## Appendix 5: Portugal's imports by country

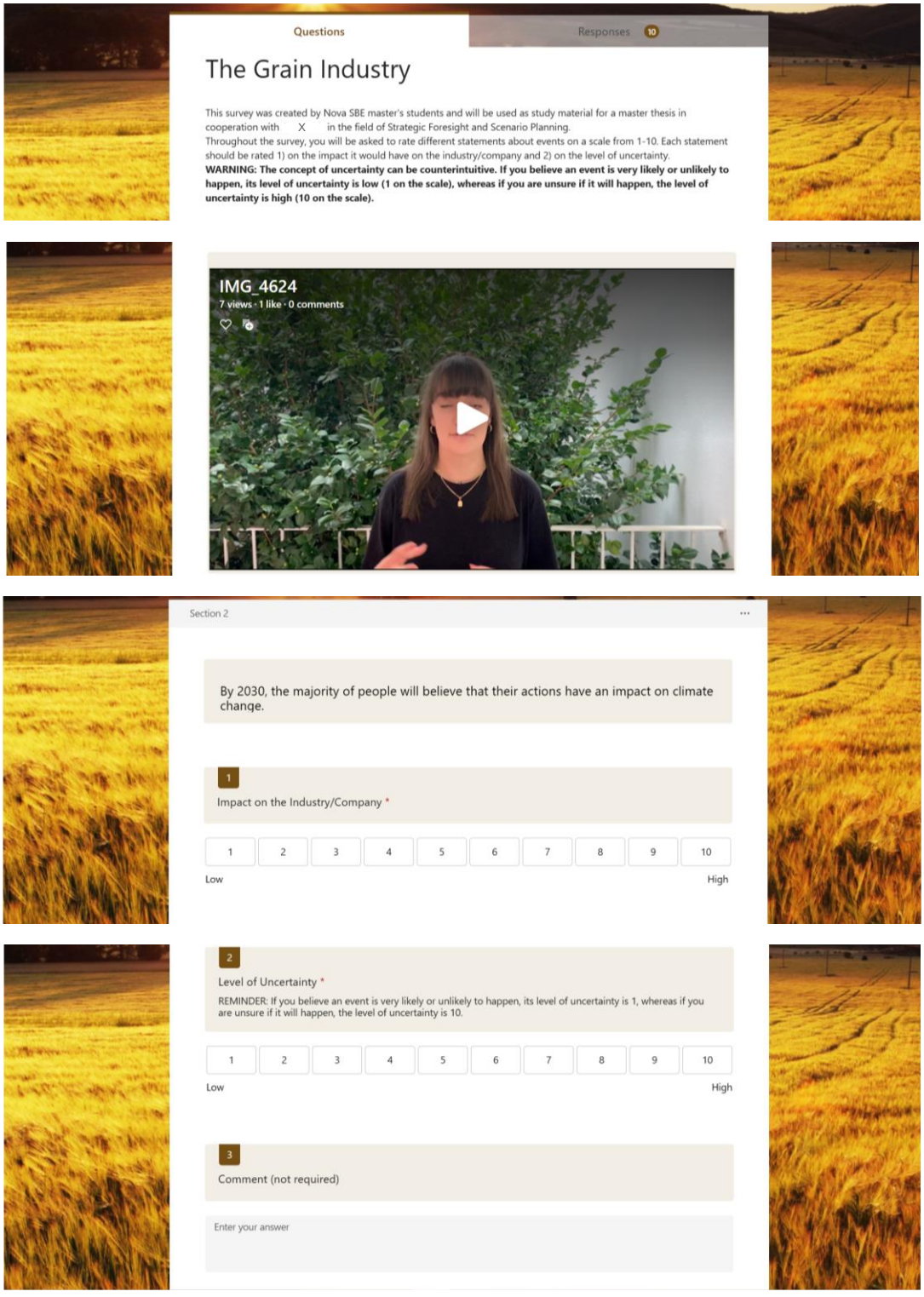
| Imports Portugal 2021 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Kidney beans | | Pulses | | Soya beans | | Cereals | |
| Rank | Country | Net weight in tons | Country | Net weight in tons | Country | Net weight in tons | Country | Net weight in tons |
| 1 | Argentina | 24,552 | Argentina | 26,609 | Brazil | 737,358 | Ukraine | 798,174 |
| 2 | Canada | 8,812 | Canada | 11,298 | Germany | 305,220 | France | 683,618 |
| 3 | Ethiopia | 2,884 | Spain | 7,305 | US | 267,146 | Brazil | 558,789 |
| 4 | China | 1,649 | Mexico | 4,036 | Canada | 97,006 | Spain | 418,835 |
| 5 | Spain | 1,619 | France | 3,553 | Spain | 2,143 | Romania | 319,163 |
| 6 | Madagascar | 678 | Ethiopia | 2,884 | France | 832 | Canada | 184,836 |
| 7 | Brazil | 642 | US | 1,900 | Romania | 425 | UK | 162,292 |
| 8 | Mexico | 504 | China | 1,694 | Italy | 212 | Bulgaria | 156,765 |
| 9 | Poland | 360 | Madagascar | 1,172 | Paraguay | 105 | Serbia | 107,475 |
| 10 | India | 241 | Brazil | 970 | Netherlands | 66 | Germany | 106,421 |
| 11 | Peru | 166 | Peru | 778 | China | 15 | Poland | 90,363 |
| 12 | Kenya | 86 | Belgium | 582 | India | 3 | Guyana | 66,594 |
| 13 | Turkey | 75 | Poland | 361 | Belgium | 1 | Denmark | 43,675 |
| 14 | Ukraine | 74 | India | 298 | Austria | 0 | Sweden | 43,403 |
| 15 | Netherlands | 67 | Egypt | 190 | Russia | 0 | Lithuania | 33,679 |
| 16 | Other | 228 | | 1,297 | | 0 | | 152,468 |
| | **Total** | **42,637** | | **64,925** | | **1,410,533** | | **3,926,550** |

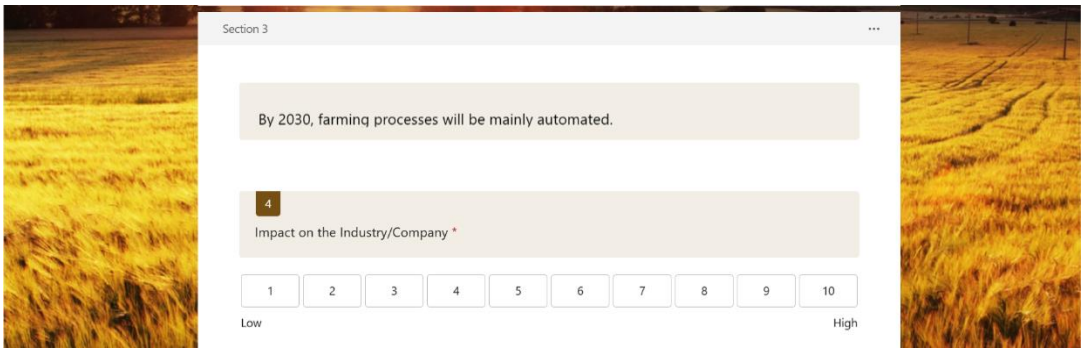
Source WITS (2022)

## Appendix 6: Feed for farm animals and pet foods

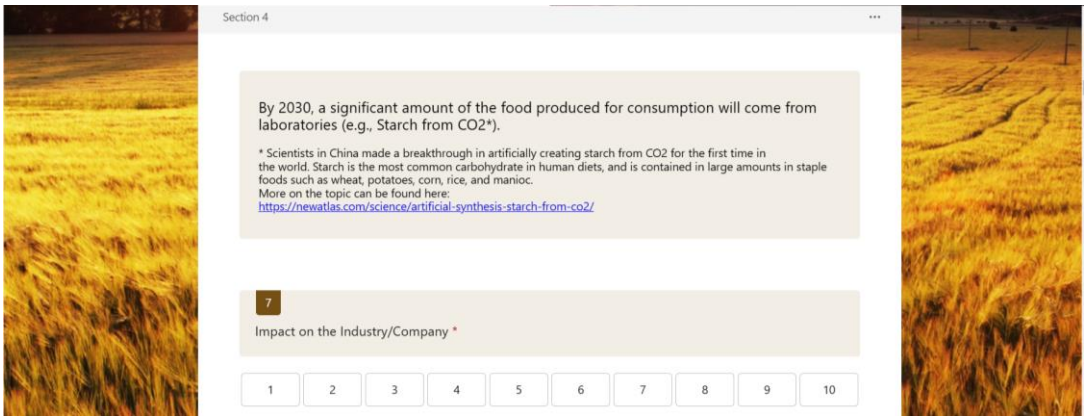


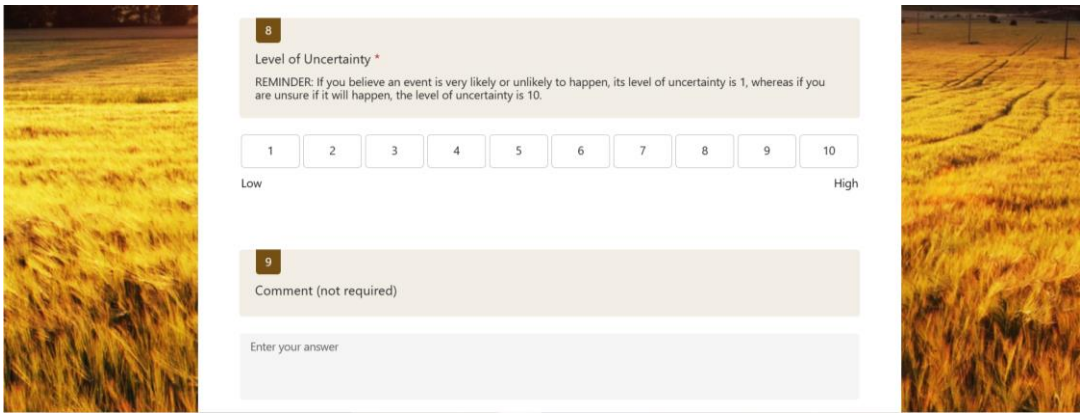
## Appendix 7: Survey

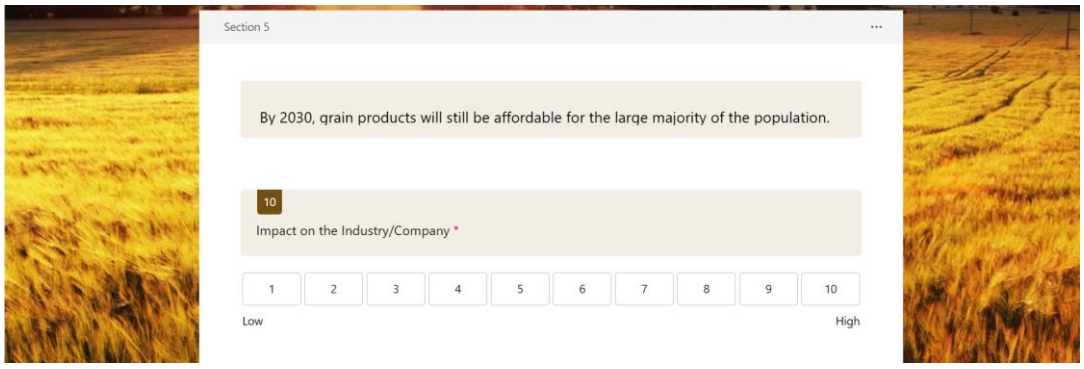


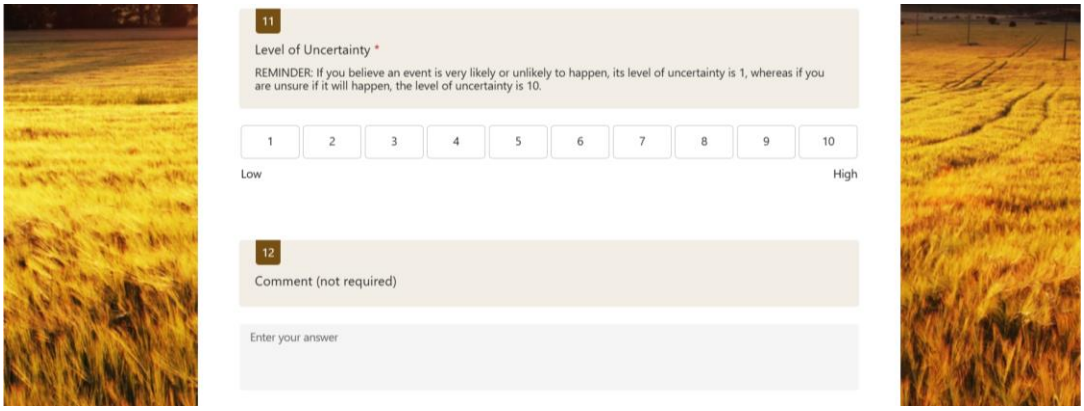

Section 3
By 2030, farming processes will be mainly automated.
4
Impact on the Industry/Company *
1 2 3 4 5 6 7 8 9 10
Low
High

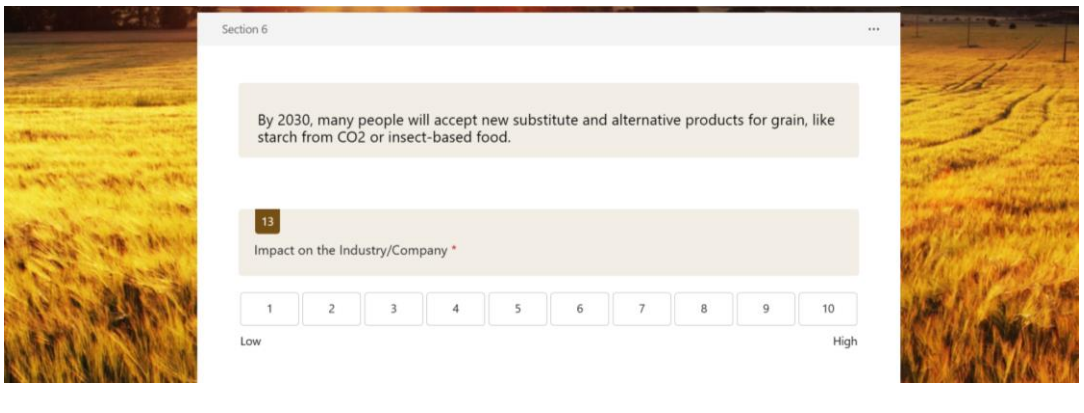

5
Level of Uncertainty *
REMINDER: If you believe an event is very likely or unlikely to happen, its level of uncertainty is 1, whereas if you are unsure if it will happen, the level of uncertainty is 10.
1 2 3 4 5 6 7 8 9 10
Low
High
6
Comment (not required)
Enter your answer

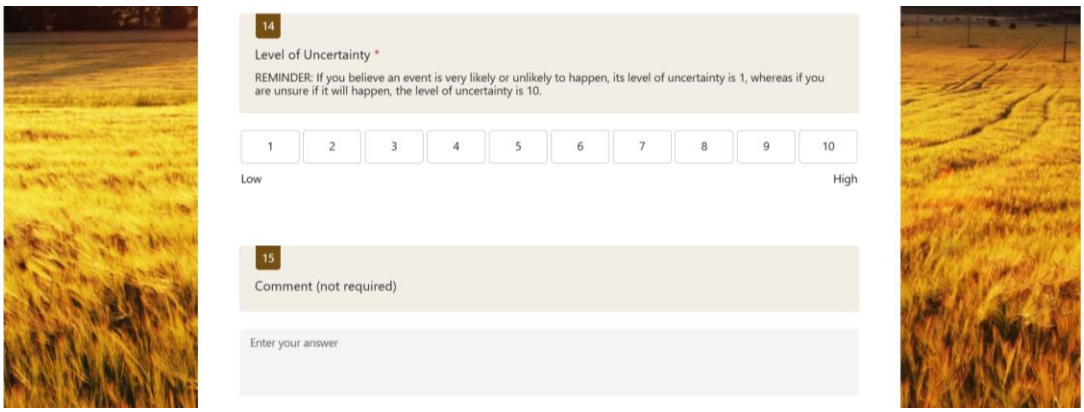

Section 4
By 2030, a significant amount of the food produced for consumption will come from laboratories (e.g., Starch from CO2*).
* Scientists in China made a breakthrough in artificially creating starch from CO2 for the first time in the world. Starch is the most common carbohydrate in human diets, and is contained in large amounts in staple foods such as wheat, potatoes, corn, rice, and manioc.
More on the topic can be found here:
https://newatlas.com/science/artificial-synthesis-starch-from-co2/
7
Impact on the Industry/Company *
1 2 3 4 5 6 7 8 9 10

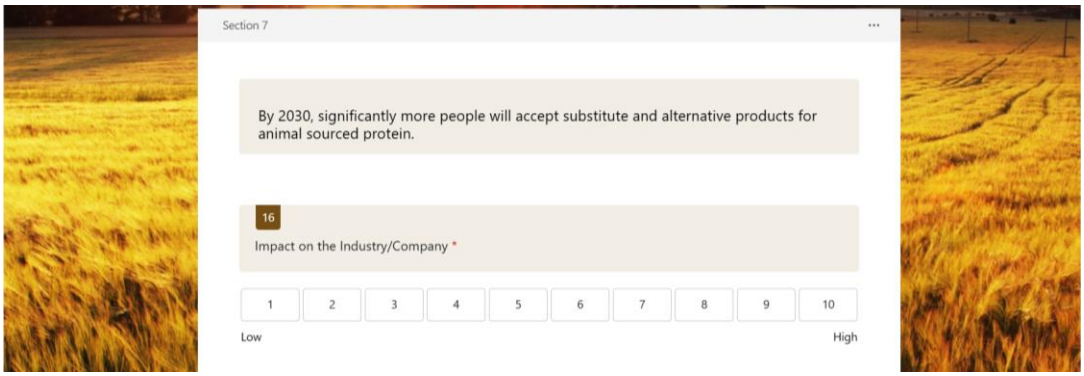

8
Level of Uncertainty *
REMINDER: If you believe an event is very likely or unlikely to happen, its level of uncertainty is 1, whereas if you are unsure if it will happen, the level of uncertainty is 10.
1 2 3 4 5 6 7 8 9 10
Low
High
9
Comment (not required)
Enter your answer


Section 5
By 2030, grain products will still be affordable for the large majority of the population.
10
Impact on the Industry/Company *
1 2 3 4 5 6 7 8 9 10
Low
High

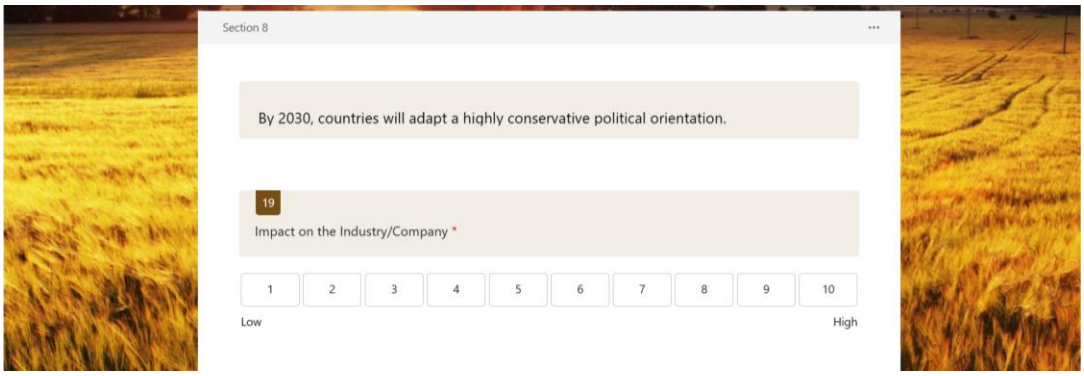

11
Level of Uncertainty *
REMINDER: If you believe an event is very likely or unlikely to happen, its level of uncertainty is 1, whereas if you are unsure if it will happen, the level of uncertainty is 10.
1 2 3 4 5 6 7 8 9 10
Low
High
12
Comment (not required)
Enter your answer

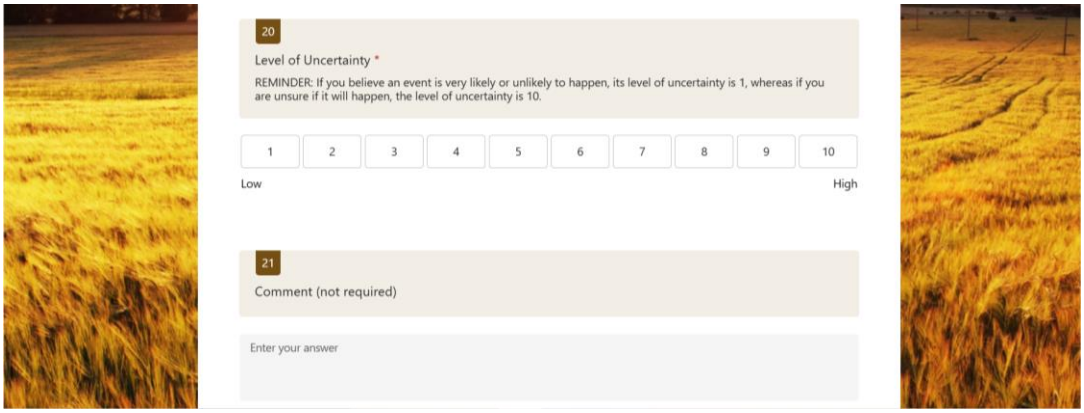

Section 6
By 2030, many people will accept new substitute and alternative products for grain, like starch from CO2 or insect-based food.
13
Impact on the Industry/Company *
1 2 3 4 5 6 7 8 9 10
Low
High


14
Level of Uncertainty *
REMINDER: If you believe an event is very likely or unlikely to happen, its level of uncertainty is 1, whereas if you are unsure if it will happen, the level of uncertainty is 10.
1 2 3 4 5 6 7 8 9 10
Low
High
15
Comment (not required)
Enter your answer

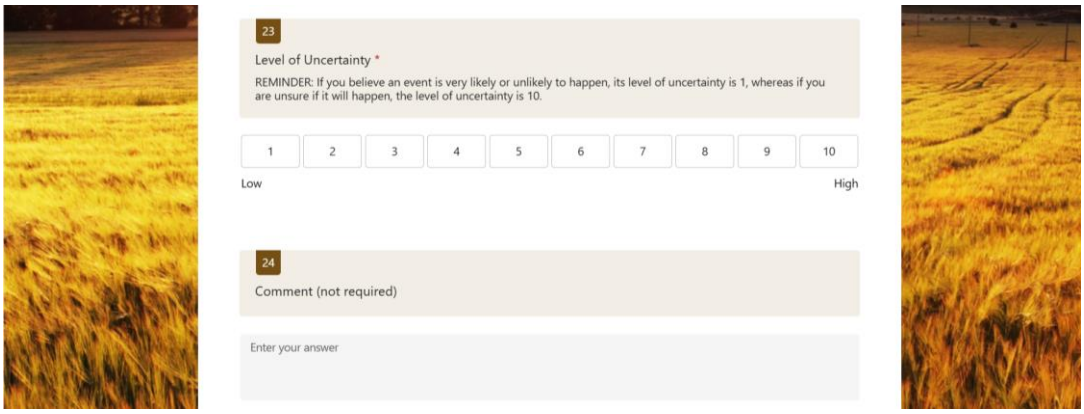

Section 7
By 2030, significantly more people will accept substitute and alternative products for animal sourced protein.
16
Impact on the Industry/Company *
1 2 3 4 5 6 7 8 9 10
Low
High

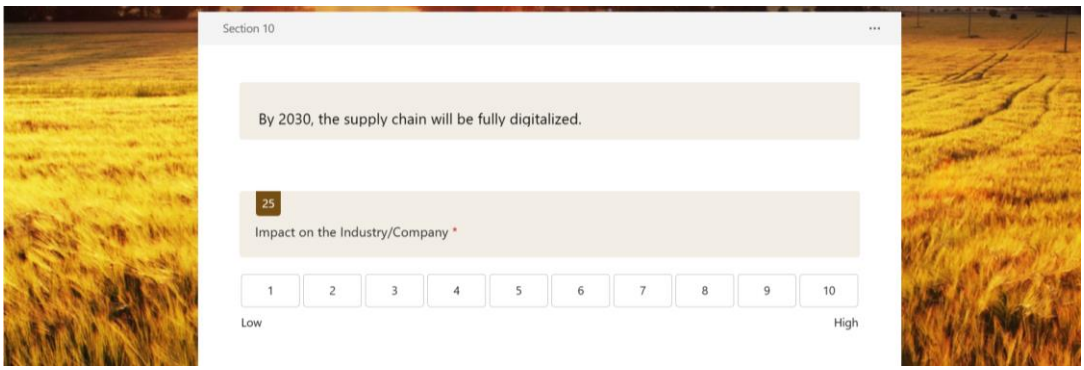

17
Level of Uncertainty *
REMINDER: If you believe an event is very likely or unlikely to happen, its level of uncertainty is 1, whereas if you are unsure if it will happen, the level of uncertainty is 10.
1 2 3 4 5 6 7 8 9 10
Low
High
18
Comment (not required)
Enter your answer


Section 8
By 2030, countries will adapt a highly conservative political orientation.
19
Impact on the Industry/Company *
1 2 3 4 5 6 7 8 9 10
Low
High

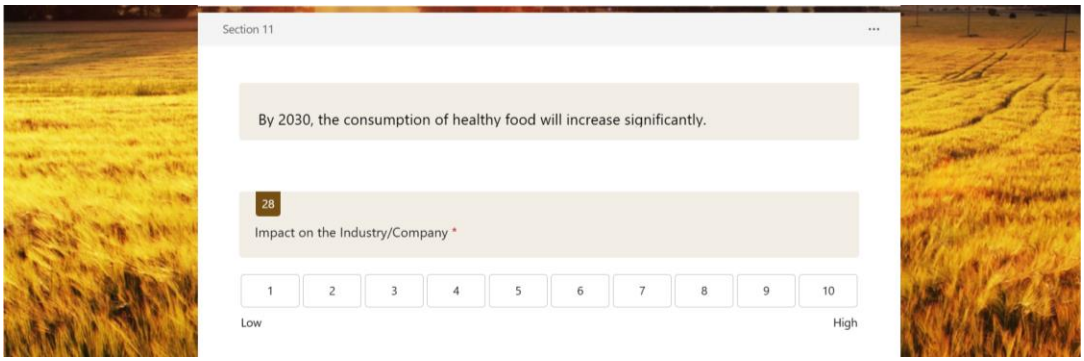

20
Level of Uncertainty *
REMINDER: If you believe an event is very likely or unlikely to happen, its level of uncertainty is 1, whereas if you are unsure if it will happen, the level of uncertainty is 10.
1 2 3 4 5 6 7 8 9 10
Low
High
21
Comment (not required)
Enter your answer

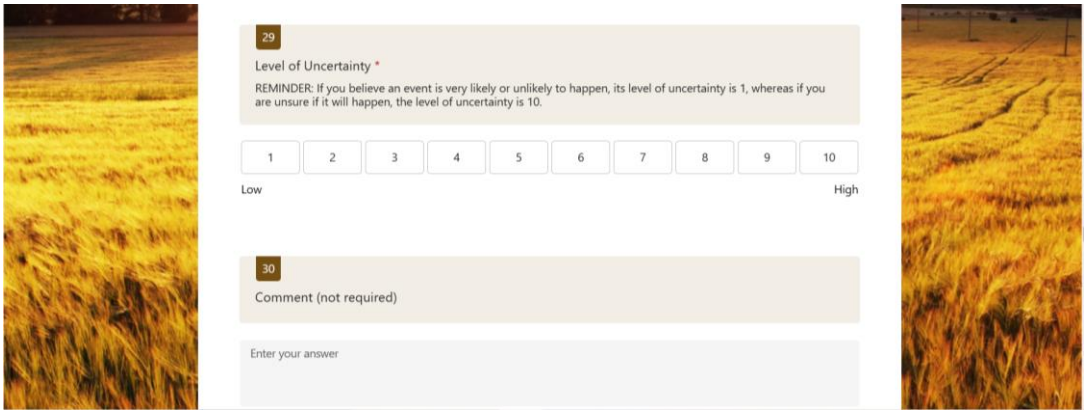

Section 9
By 2030, logistical issues will make it more difficult to meet delivery times.
22
Impact on the Industry/Company *
1 2 3 4 5 6 7 8 9 10
Low
High


23
Level of Uncertainty *
REMINDER: If you believe an event is very likely or unlikely to happen, its level of uncertainty is 1, whereas if you are unsure if it will happen, the level of uncertainty is 10.
1 2 3 4 5 6 7 8 9 10
Low
High
24
Comment (not required)
Enter your answer

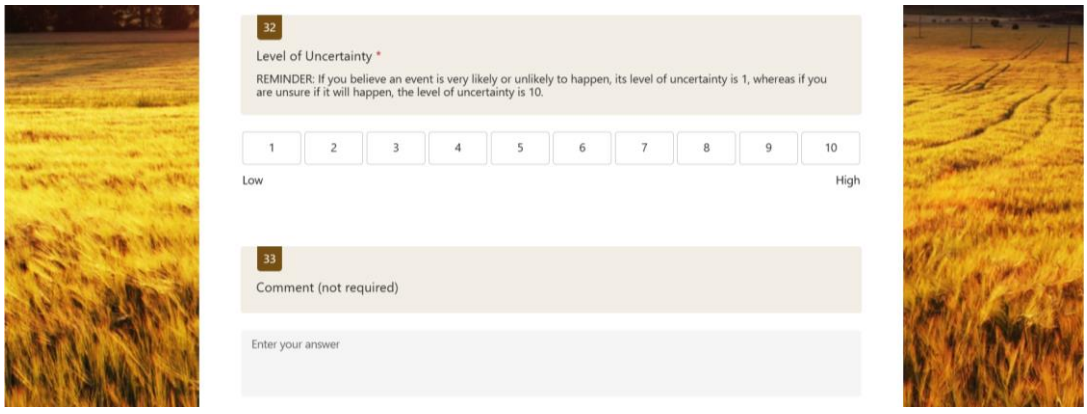

Section 10
By 2030, the supply chain will be fully digitalized.
25
Impact on the Industry/Company *
1 2 3 4 5 6 7 8 9 10
Low
High

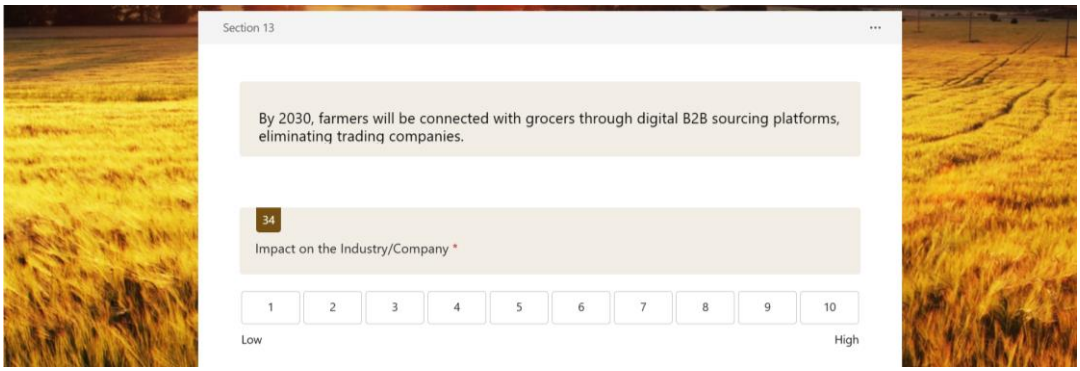

26
Level of Uncertainty *
REMINDER: If you believe an event is very likely or unlikely to happen, its level of uncertainty is 1, whereas if you are unsure if it will happen, the level of uncertainty is 10.
1 2 3 4 5 6 7 8 9 10
Low
High
27
Comment (not required)
Enter your answer


Section 11
By 2030, the consumption of healthy food will increase significantly.
28
Impact on the Industry/Company *
1 2 3 4 5 6 7 8 9 10
Low
High

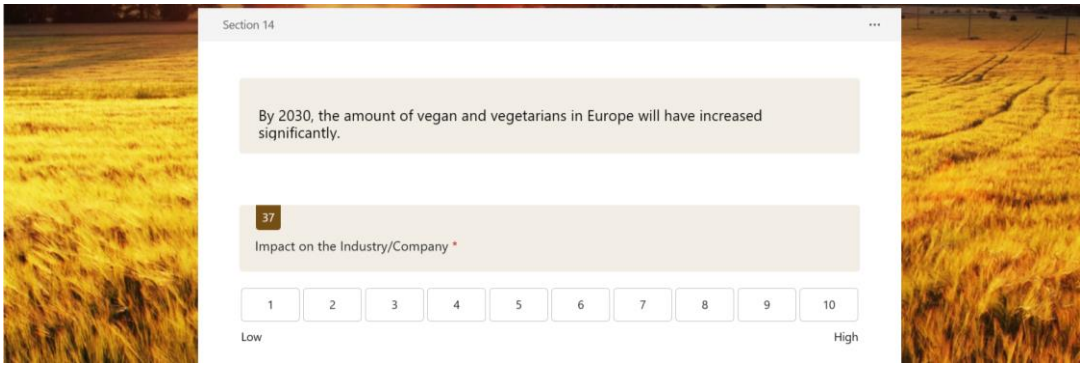

29
Level of Uncertainty *
REMINDER: If you believe an event is very likely or unlikely to happen, its level of uncertainty is 1, whereas if you are unsure if it will happen, the level of uncertainty is 10.
1 2 3 4 5 6 7 8 9 10
Low
High
30
Comment (not required)
Enter your answer

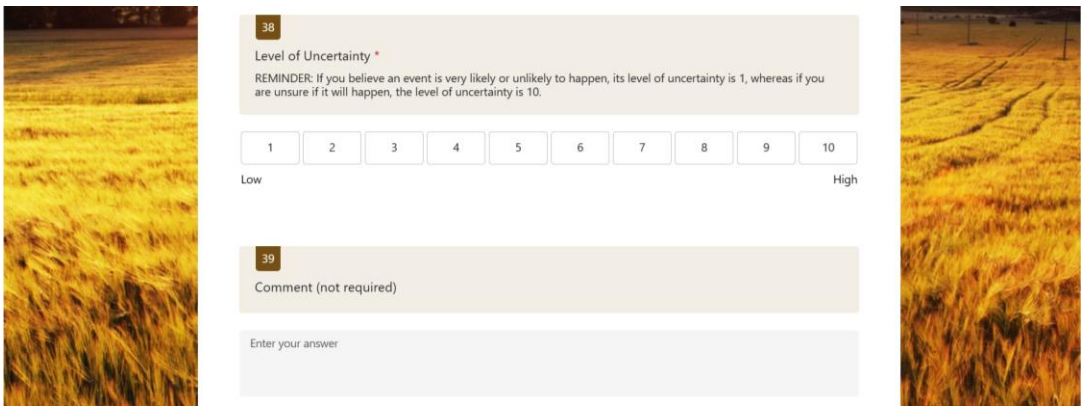

Section 12
By 2030, people will show strong preference for local food (i.e. food that has travelled only short distances or is marketed directly by the producer).
31
Impact on the Industry/Company *
1 2 3 4 5 6 7 8 9 10
Low
High

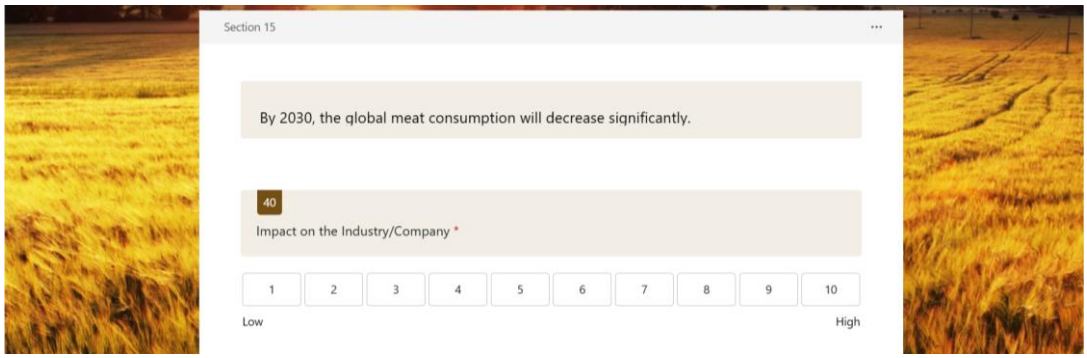

32
Level of Uncertainty *
REMINDER: If you believe an event is very likely or unlikely to happen, its level of uncertainty is 1, whereas if you are unsure if it will happen, the level of uncertainty is 10.
1 2 3 4 5 6 7 8 9 10
Low
High
33
Comment (not required)
Enter your answer


Section 13
By 2030, farmers will be connected with grocers through digital B2B sourcing platforms, eliminating trading companies.
34
Impact on the Industry/Company *
1 2 3 4 5 6 7 8 9 10
Low
High

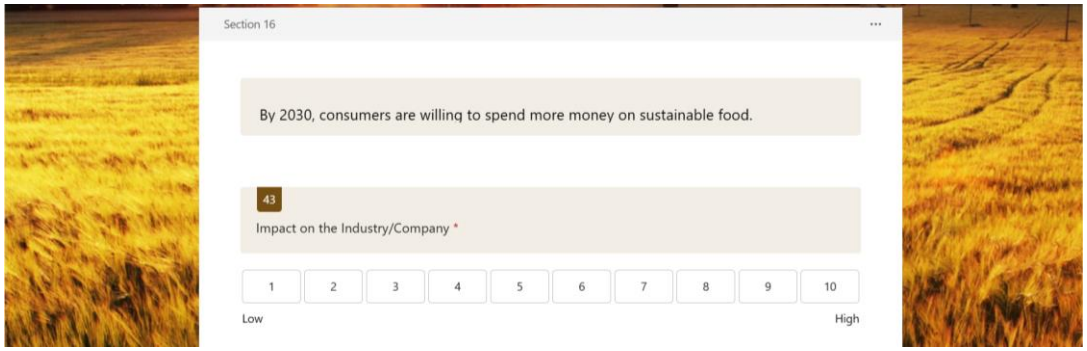

35
Level of Uncertainty *
REMINDER: If you believe an event is very likely or unlikely to happen, its level of uncertainty is 1, whereas if you are unsure if it will happen, the level of uncertainty is 10.
1 2 3 4 5 6 7 8 9 10
Low
High
36
Comment (not required)
Enter your answer

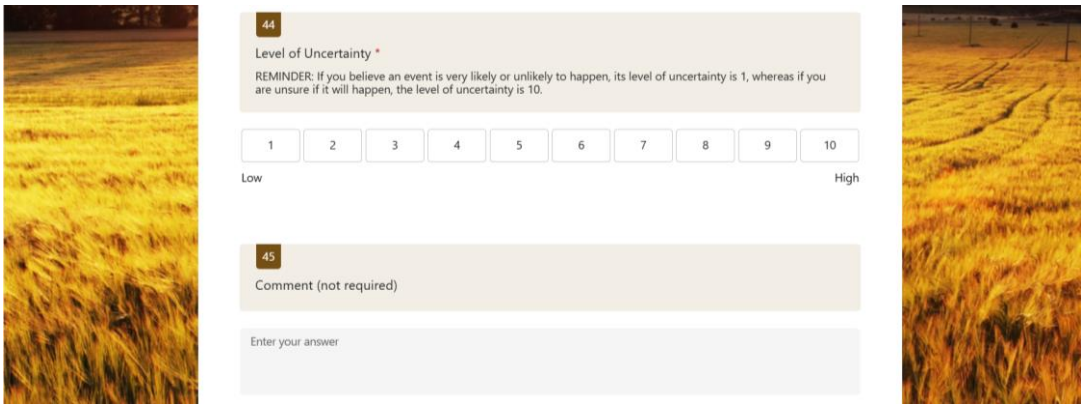

Section 14
By 2030, the amount of vegan and vegetarians in Europe will have increased significantly.
37
Impact on the Industry/Company *
1 2 3 4 5 6 7 8 9 10
Low
High

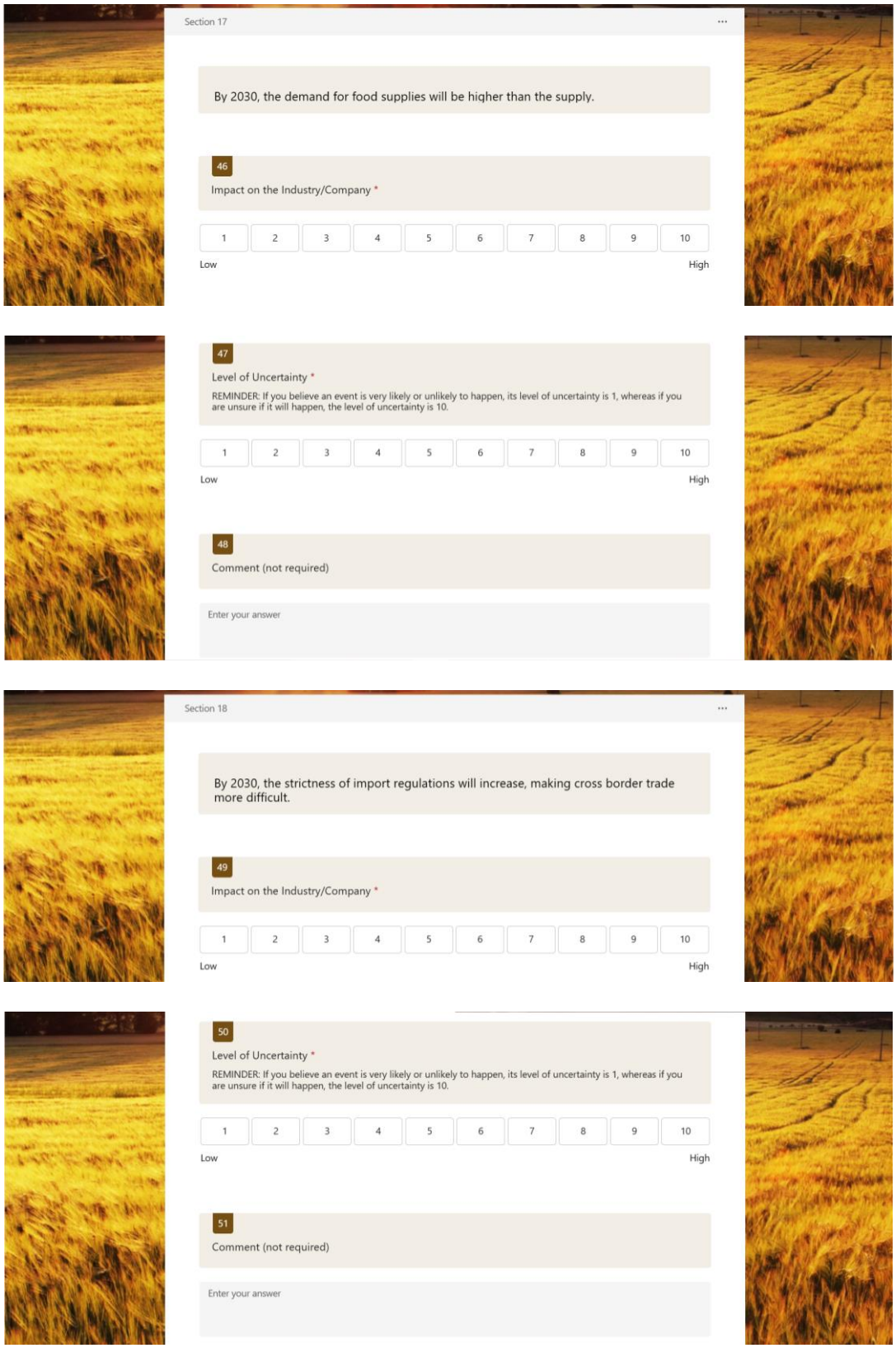

38
Level of Uncertainty *
REMINDER: If you believe an event is very likely or unlikely to happen, its level of uncertainty is 1, whereas if you are unsure if it will happen, the level of uncertainty is 10.
1 2 3 4 5 6 7 8 9 10
Low
High
39
Comment (not required)
Enter your answer


Section 15
By 2030, the global meat consumption will decrease significantly.
40
Impact on the Industry/Company *
1 2 3 4 5 6 7 8 9 10
Low
High


41
Level of Uncertainty *
REMINDER: If you believe an event is very likely or unlikely to happen, its level of uncertainty is 1, whereas if you are unsure if it will happen, the level of uncertainty is 10.
1 2 3 4 5 6 7 8 9 10
Low
High
42
Comment (not required)
Enter your answer


Section 16
By 2030, consumers are willing to spend more money on sustainable food.
43
Impact on the Industry/Company *
1 2 3 4 5 6 7 8 9 10
Low
High

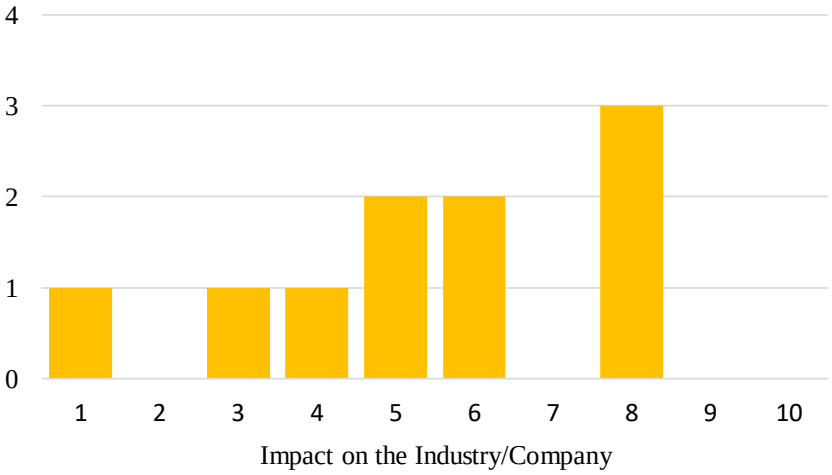

44
Level of Uncertainty *
REMINDER: If you believe an event is very likely or unlikely to happen, its level of uncertainty is 1, whereas if you are unsure if it will happen, the level of uncertainty is 10.
1 2 3 4 5 6 7 8 9 10
Low
High
45
Comment (not required)
Enter your answer


Section 17
By 2030, the demand for food supplies will be higher than the supply.
46
Impact on the Industry/Company *
1 2 3 4 5 6 7 8 9 10
Low
High
47
Level of Uncertainty *
REMINDER: If you believe an event is very likely or unlikely to happen, its level of uncertainty is 1, whereas if you are unsure if it will happen, the level of uncertainty is 10.
1 2 3 4 5 6 7 8 9 10
Low
High
48
Comment (not required)
Enter your answer
Section 18
By 2030, the strictness of import regulations will increase, making cross border trade more difficult.
49
Impact on the Industry/Company *
1 2 3 4 5 6 7 8 9 10
Low
High
50
Level of Uncertainty *
REMINDER: If you believe an event is very likely or unlikely to happen, its level of uncertainty is 1, whereas if you are unsure if it will happen, the level of uncertainty is 10.
1 2 3 4 5 6 7 8 9 10
Low
High
51
Comment (not required)
Enter your answer

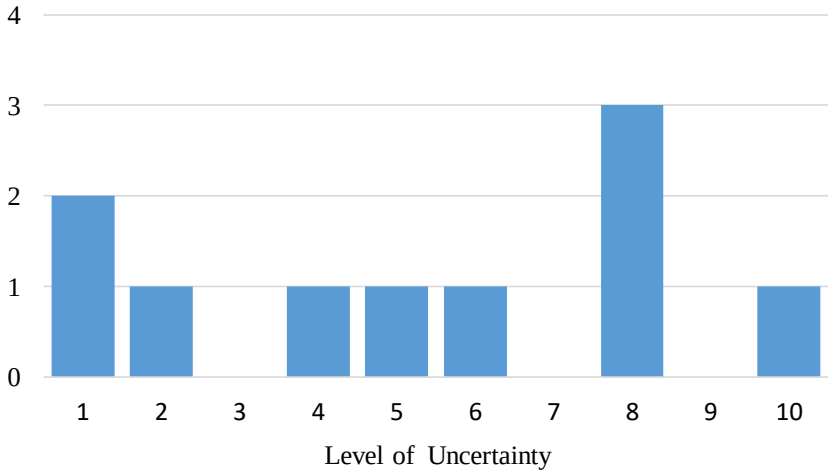
**Appendix 8: Survey Report**

## Delphi Statement 1

## By 2030, the majority of people will believe that their actions have an impact on climate change.




| | |
|---|---|
| Min. | 1.00 |
| Max. | 8.00 |
| Mean | 5.40 |
| SD | 2.32 |
| Var. | 5.38 |
| Count | 10.00 |

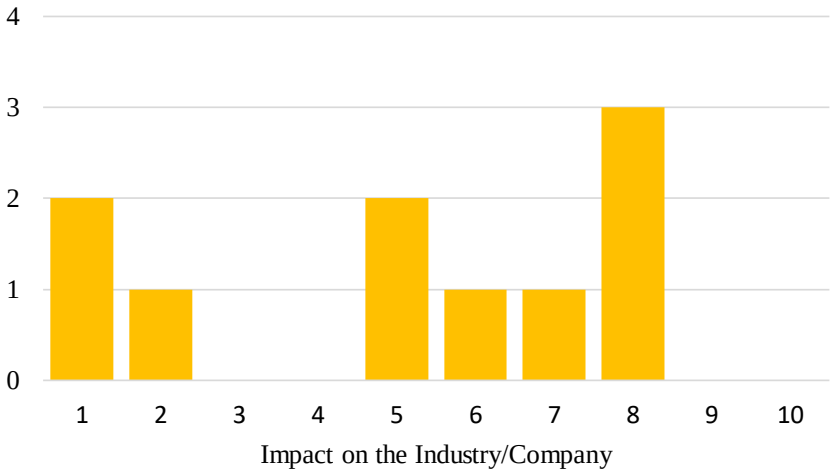



| | |
|---|---|
| Min. | 1.00 |
| Max. | 10.00 |
| Mean | 5.30 |
| SD | 3.23 |
| Var. | 10.46 |
| Count | 10.00 |

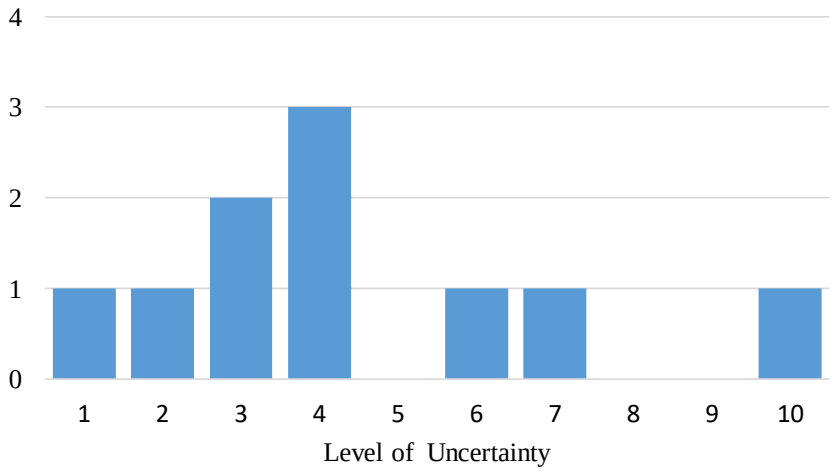
**Comment:**
Food security will always supersede food safety or sustainability concerns.

## Delphi Statement 2

## By 2030, farming processes will be mainly automated.




| | |
|---|---|
| Min. | 1.00 |
| Max. | 8.00 |
| Mean | 5.10 |
| SD | 2.85 |
| Var. | 8.10 |
| Count | 10.00 |



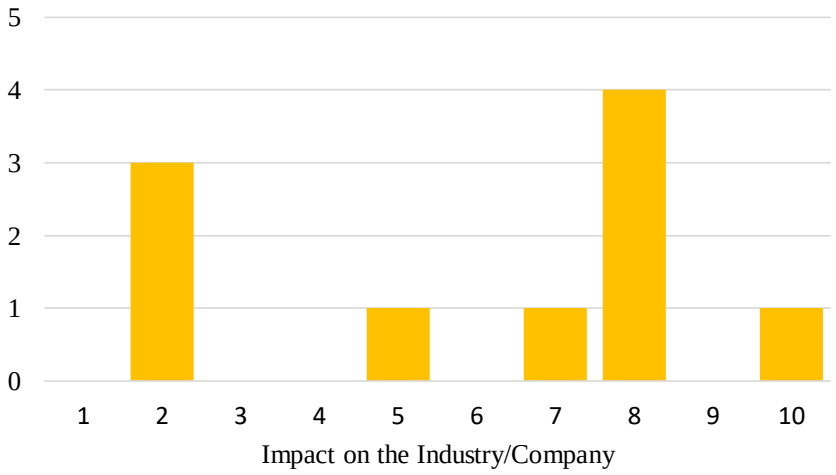

| | |
|---|---|
| Min. | 1.00 |
| Max. | 10.00 |
| Mean | 4.40 |
| SD | 2.63 |
| Var. | 6.93 |
| Count | 10.00 |

**Comment:**

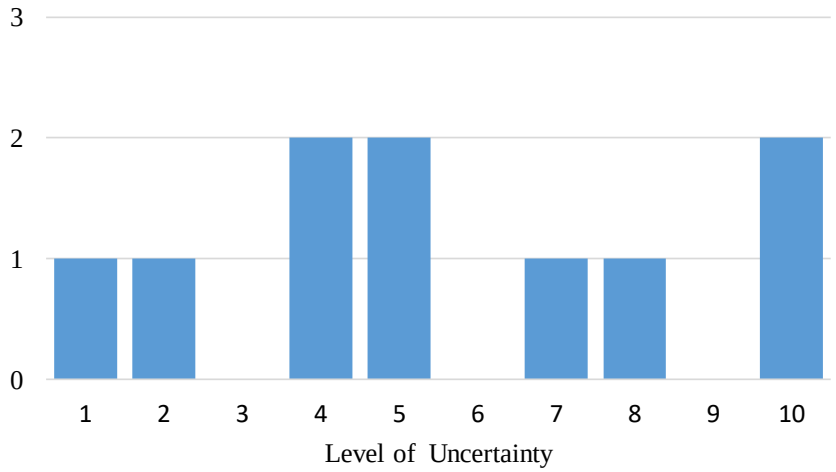
X trades mainly commodities from extensive crops, not intensive crops. The automatization of farming equipment and farm agricultural/management control have been developed in the last decades, being automatization only possible in some segments of the daily work operations or decision processes. There is still an elevated degree of human control and human work force needed in order to correctly preform that work. The cost of the automatization of some processes and above all, of equipment itself, will still hinder that possibility for decades to come. Rich farming is only possible in rich countries with farmers highly supported by subsidies and low acreage to control. Having been a commercial Director of a 20.000ha farming project, i know this for a fact.

**Delphi Statement 3**

**By 2030, a significant amount of the food produced for consumption will come from laboratories (e.g., Starch from CO2*).**




| | |
|---|---|
| Min. | 2.00 |
| Max. | 10.00 |
| Mean | 6.00 |
| SD | 3.02 |
| Var. | 9.11 |
| Count | 10.00 |

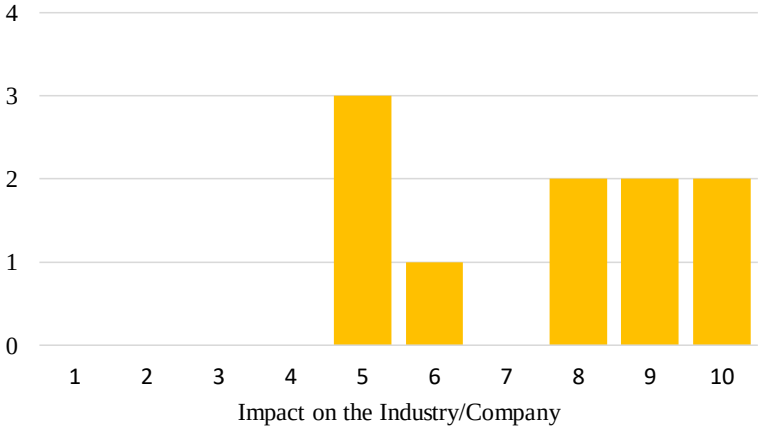



| | |
|---|---|
| Min. | 1.00 |
| Max. | 10.00 |
| Mean | 5.60 |
| SD | 3.10 |
| Var. | 9.60 |
| Count | 10.00 |

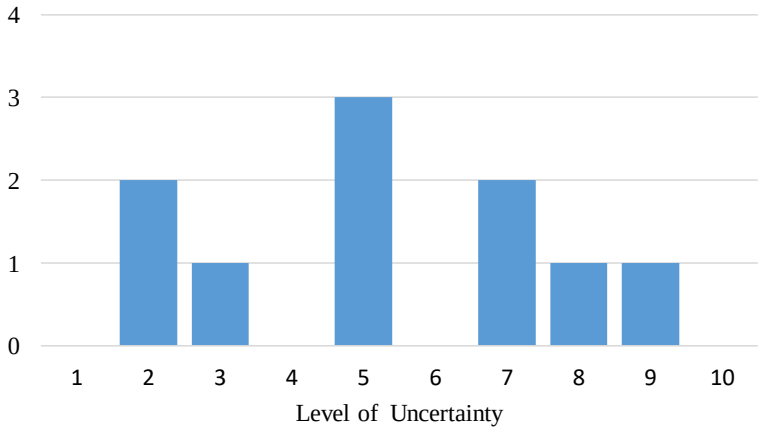
**Comment:**
No it wont.

**Delphi Statement 4**

**By 2030, grain products will still be affordable for the large majority of the population.**




| | |
|---|---|
| Min. | 5.00 |
| Max. | 10.00 |
| Mean | 7.50 |
| SD | 2.07 |
| Var. | 4.28 |
| Count | 10.00 |



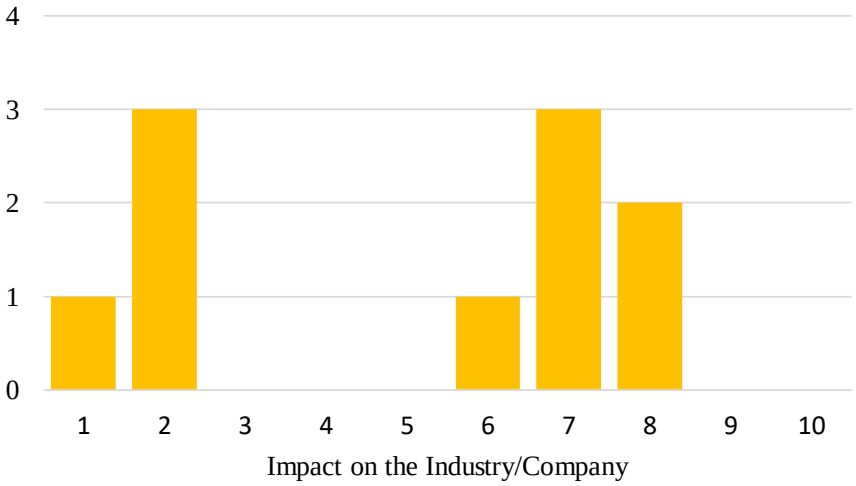

| | |
|---|---|
| Min. | 2.00 |
| Max. | 9.00 |
| Mean | 5.30 |
| SD | 2.45 |
| Var. | 6.01 |
| Count | 10.00 |

**Comment:**

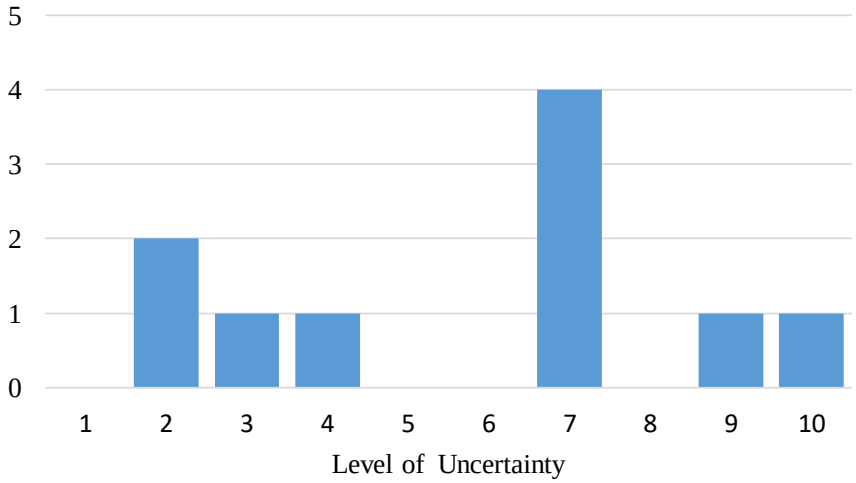
Price supercicles end. Inflation always corrects when there is low or no consumption.

**Delphi Statement 5**

**By 2030, many people will accept new substitute and alternative products for grain, like starch from CO2 or insect-based food.**




| | |
|---|---|
| Min. | 1.00 |
| Max. | 8.00 |
| Mean | 5.00 |
| SD | 2.87 |
| Var. | 8.22 |
| Count | 10.00 |

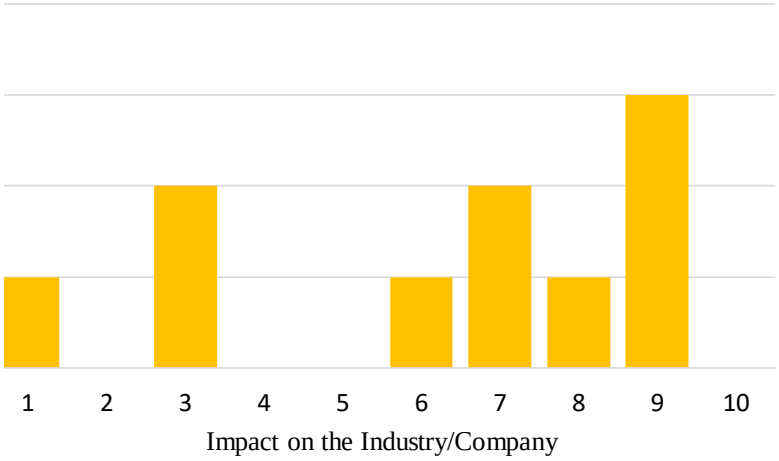



| | |
|---|---|
| Min. | 2.00 |
| Max. | 10.00 |
| Mean | 5.80 |
| SD | 2.86 |
| Var. | 8.18 |
| Count | 10.00 |

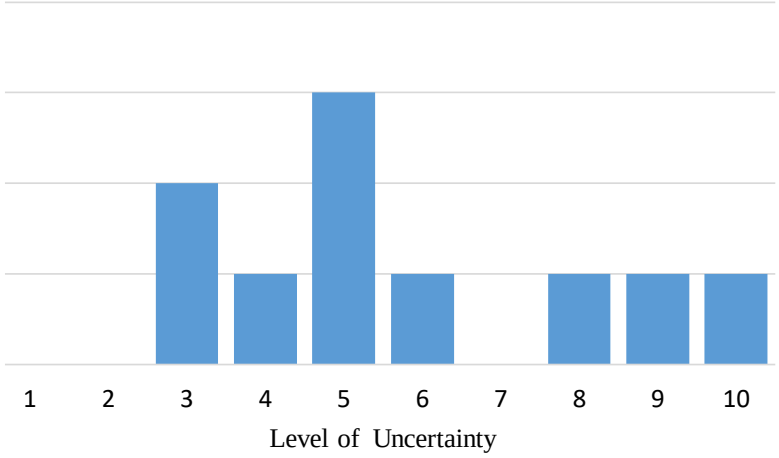
**Comment:**

**Delphi Statement 6**

**By 2030, significantly more people will accept substitute and alternative products for animal protein.**




| | |
|---|---|
| Min. | 1.00 |
| Max. | 9.00 |
| Mean | 6.20 |
| SD | 2.90 |
| Var. | 8.40 |
| Count | 10.00 |

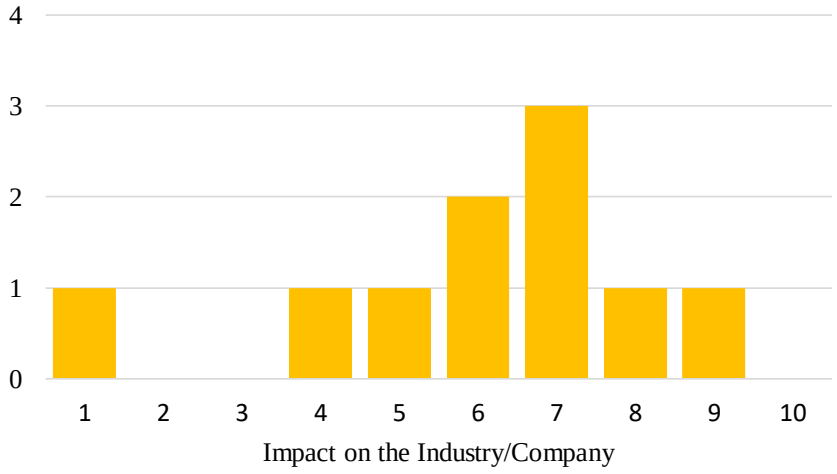



| | |
|---|---|
| Min. | 3.00 |
| Max. | 10.00 |
| Mean | 5.80 |
| SD | 2.44 |
| Var. | 5.96 |
| Count | 10.00 |

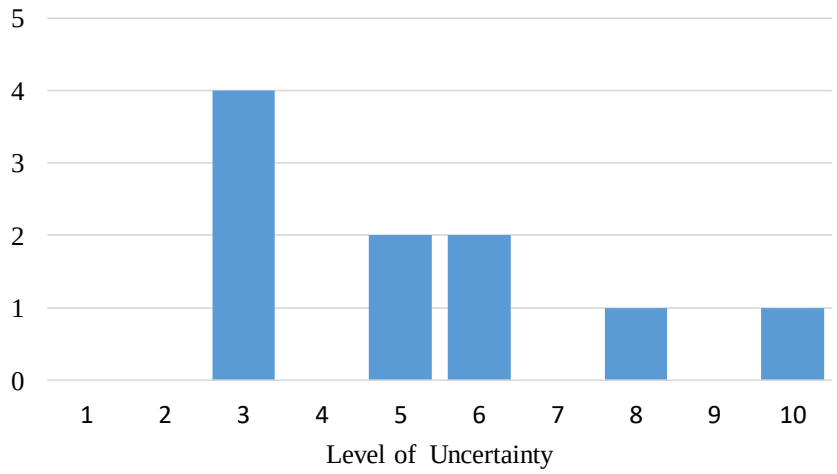
**Comment:**

**Delphi Statement 7**

**By 2030, countries will adapt a highly conservative political orientation.**




| | |
|---|---|
| Min. | 1.00 |
| Max. | 9.00 |
| Mean | 6.00 |
| SD | 2.26 |
| Var. | 5.11 |
| Count | 10.00 |

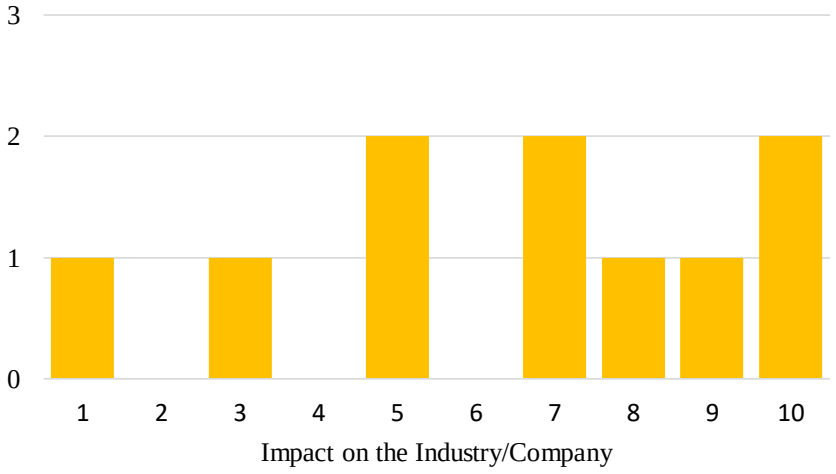



| | |
|---|---|
| Min. | 3.00 |
| Max. | 10.00 |
| Mean | 5.20 |
| SD | 2.39 |
| Var. | 5.73 |
| Count | 10.00 |

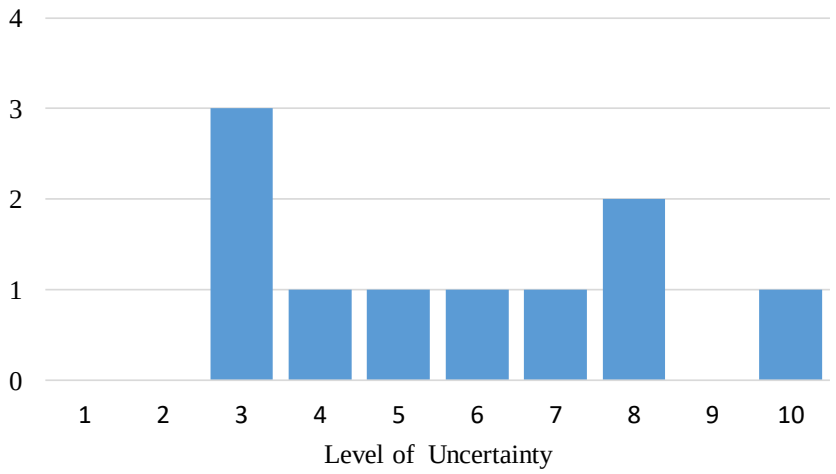
**Comment:**

**Delphi Statement 8**

**By 2030, logistical issues will make it more difficult to meet delivery times.**




| | |
|---|---|
| Min. | 1.00 |
| Max. | 10.00 |
| Mean | 6.50 |
| SD | 2.99 |
| Var. | 8.94 |
| Count | 10.00 |



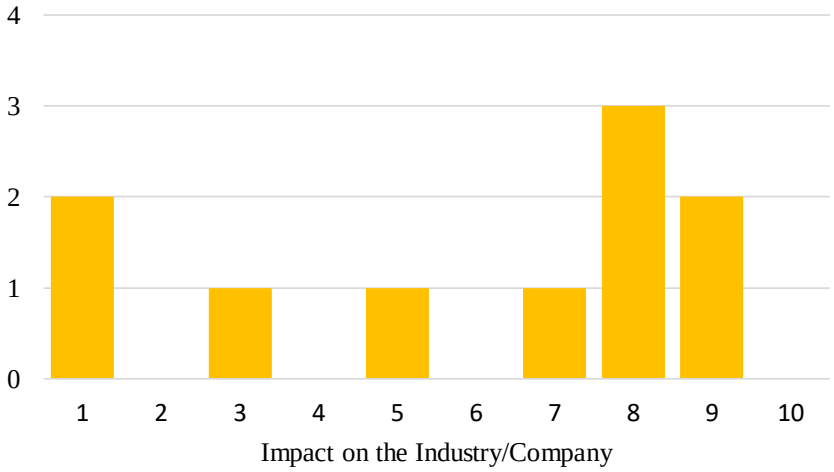

| | |
|---|---|
| Min. | 3.00 |
| Max. | 10.00 |
| Mean | 5.70 |
| SD | 2.50 |
| Var. | 6.23 |
| Count | 10.00 |

**Comment:**

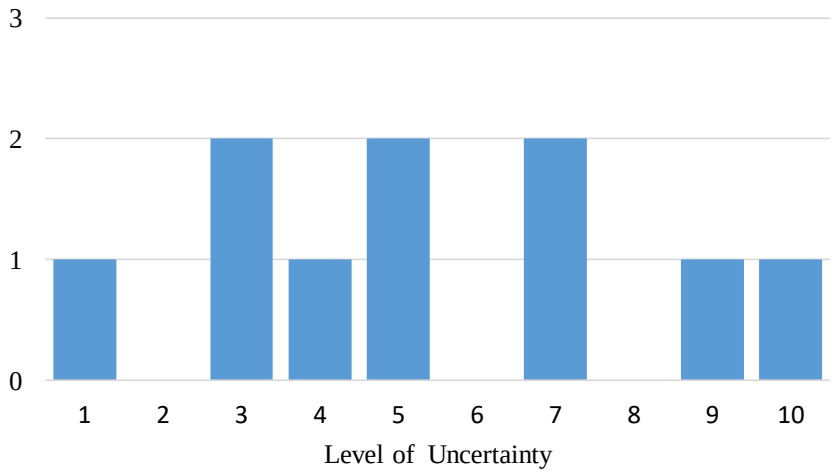
The covid cycle was used by the main logistical companies, namely sea transporters to squeeze the market as much as possible with a artificially created crisis. Ex: Just check the Maersk yearly profits reports from 2021 and 2022 (10x2021). When their profits will return to bellow 21 levels, containers will mysteriously get cheap and available again.

**Delphi Statement 9**

**By 2030, the supply chain will be fully digitalized.**




| | |
|---|---|
| Min. | 1.00 |
| Max. | 9.00 |
| Mean | 5.90 |
| SD | 3.18 |
| Var. | 10.10 |
| Count | 10.00 |

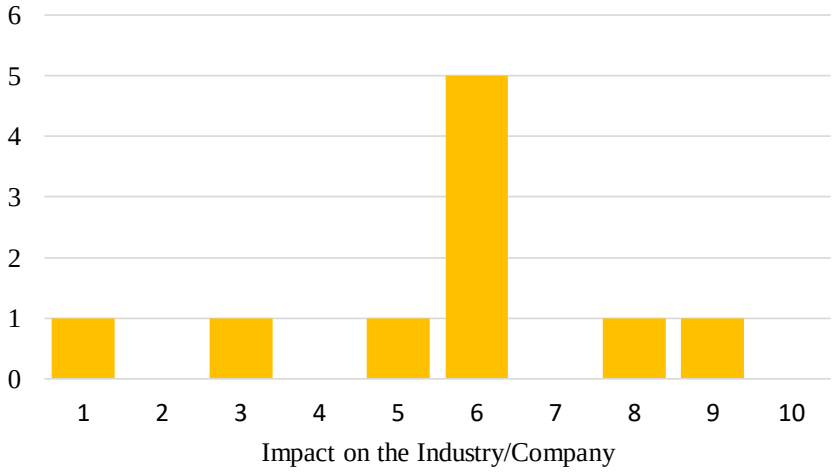



| | |
|---|---|
| Min. | 1.00 |
| Max. | 10.00 |
| Mean | 5.40 |
| SD | 2.84 |
| Var. | 8.04 |
| Count | 10.00 |

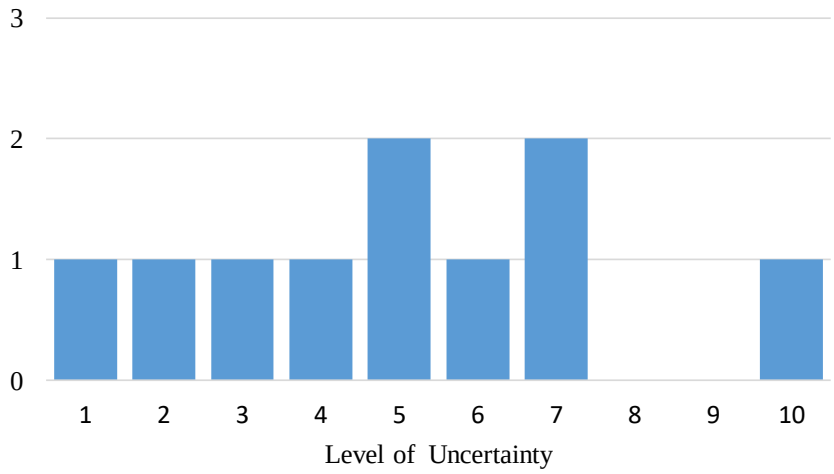
**Comment:**
Impossible. Many geographies of origin will not have that technological capability.

**Delphi Statement 10**

**By 2030, the consumption of healthy food will increase significantly.**




| | |
|---|---|
| Min. | 1.00 |
| Max. | 9.00 |
| Mean | 5.60 |
| SD | 2.27 |
| Var. | 5.16 |
| Count | 10.00 |

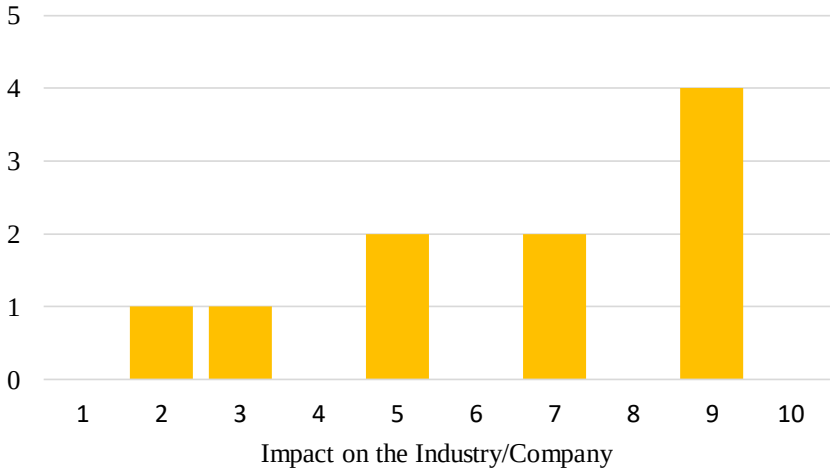



| | |
|---|---|
| Min. | 1.00 |
| Max. | 10.00 |
| Mean | 5.00 |
| SD | 2.67 |
| Var. | 7.11 |
| Count | 10.00 |

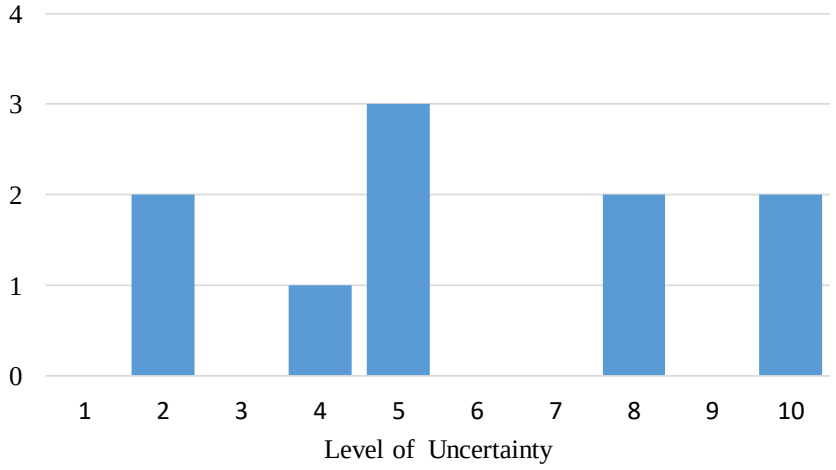
**Comment:**
If the inflation cycle will have ended at least some years before that.

**Delphi Statement 11**

**By 2030, people will show strong preference for local food (i.e. food that has travelled only short distances or is marketed directly by the producer).**




| | |
|---|---|
| Min. | 2.00 |
| Max. | 9.00 |
| Mean | 6.50 |
| SD | 2.64 |
| Var. | 6.94 |
| Count | 10.00 |

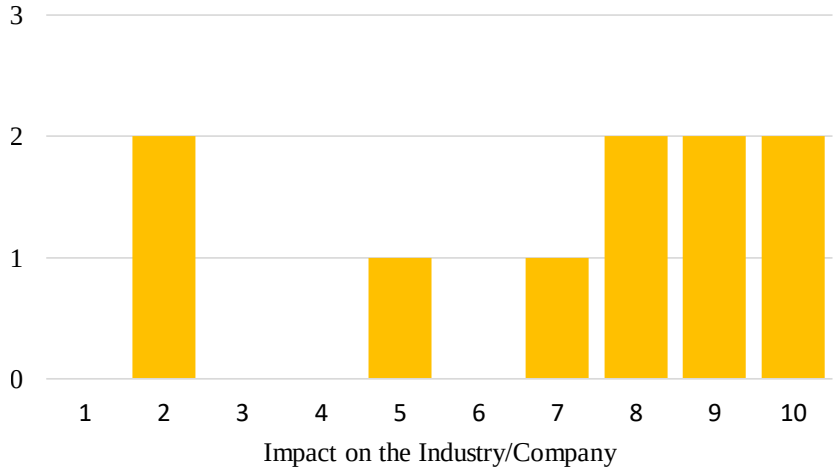



| | |
|---|---|
| Min. | 2.00 |
| Max. | 10.00 |
| Mean | 5.90 |
| SD | 2.96 |
| Var. | 8.77 |
| Count | 10.00 |

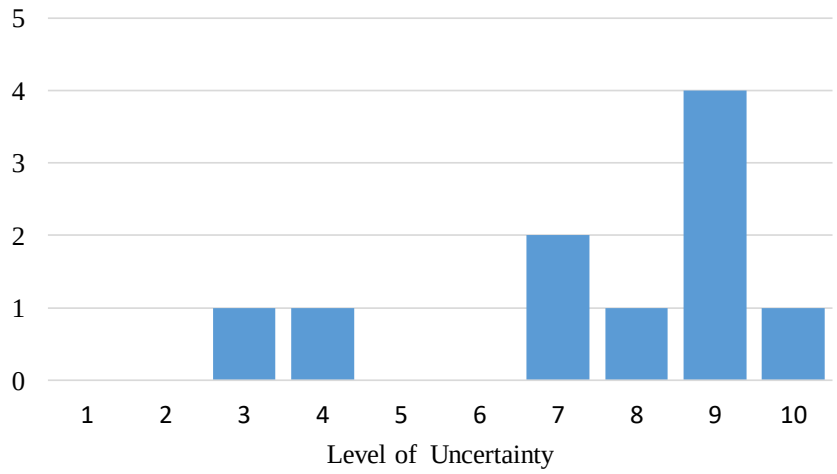
**Comment:**
Only in big urban sites, with segments of the population with high purchase power. Most of the provenance allegations are fake, especially in the PT market, if subjected to intensive traceably tests

**Delphi Statement 12**

**By 2030, farmers will be connected with grocers through digital B2B sourcing platforms, eliminating trading companies.**




| | |
|---|---|
| Min. | 2.00 |
| Max. | 10.00 |
| Mean | 7.00 |
| SD | 3.02 |
| Var. | 9.11 |
| Count | 10.00 |

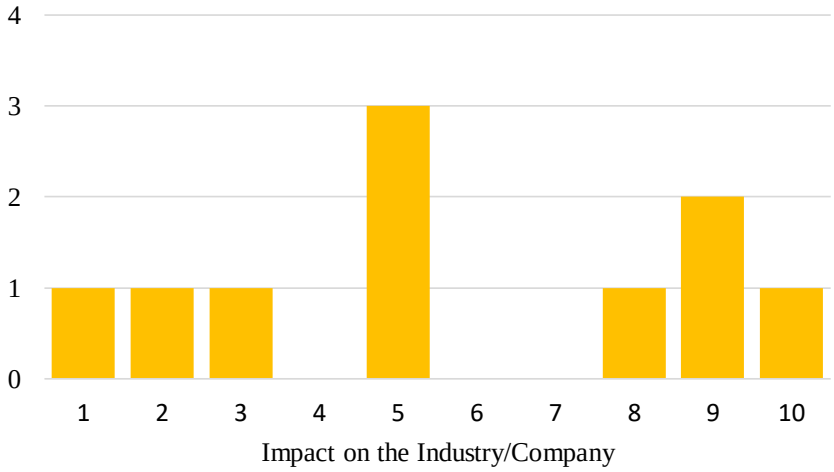



| | |
|---|---|
| Min. | 3.00 |
| Max. | 10.00 |
| Mean | 7.50 |
| SD | 2.32 |
| Var. | 5.39 |
| Count | 10.00 |

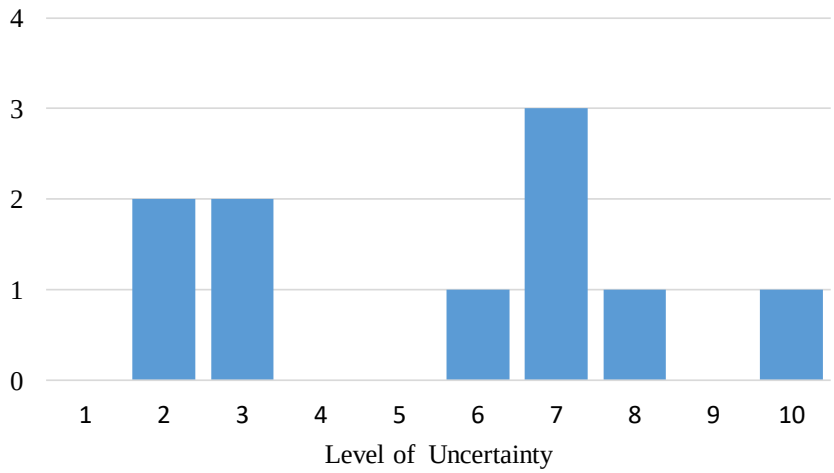
**Comment:**
Only viable in specific sectors, such as organics (example).

**Delphi Statement 13**

**By 2030, the amount of vegan and vegetarians in Europe will have increased significantly.**




| | |
|---|---|
| Min. | 1.00 |
| Max. | 10.00 |
| Mean | 5.70 |
| SD | 3.16 |
| Var. | 10.01 |
| Count | 10.00 |

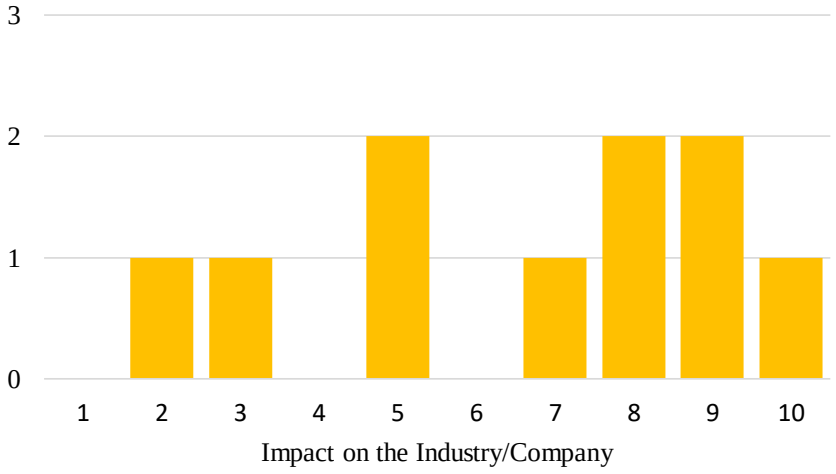



| | |
|---|---|
| Min. | 2.00 |
| Max. | 10.00 |
| Mean | 5.50 |
| SD | 2.80 |
| Var. | 7.83 |
| Count | 10.00 |

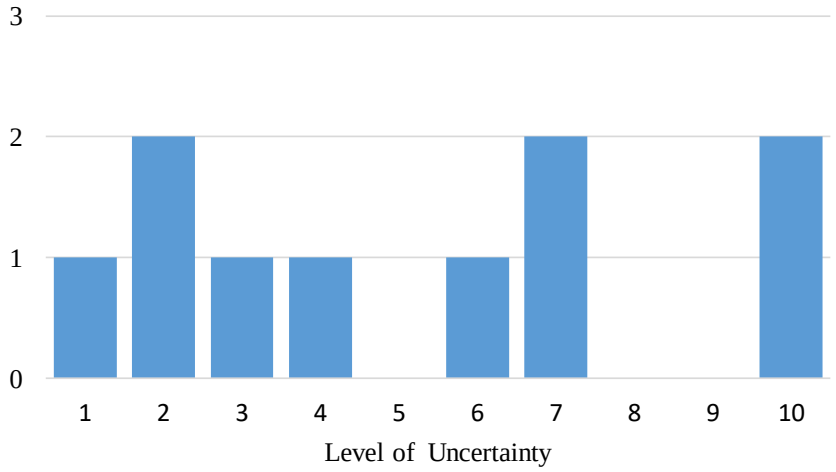
**Comment:**

**Delphi Statement 14**

**By 2030, the global meat consumption will decrease significantly.**




| | |
|---|---|
| Min. | 2.00 |
| Max. | 10.00 |
| Mean | 6.60 |
| SD | 2.72 |
| Var. | 7.38 |
| Count | 10.00 |

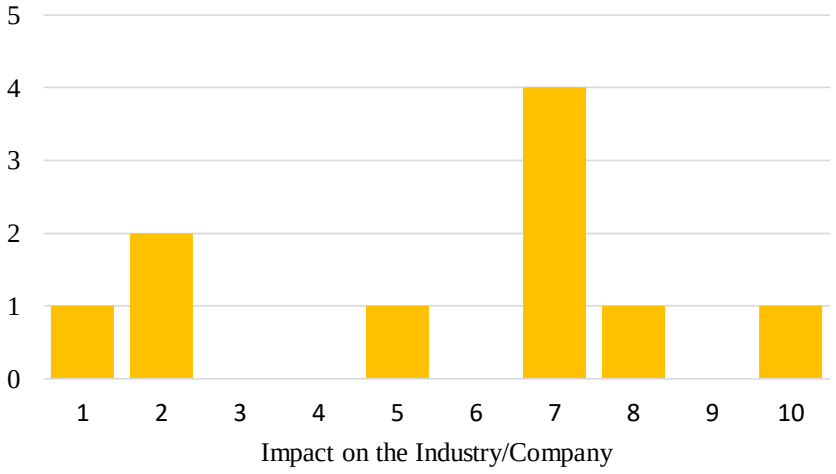



| | |
|---|---|
| Min. | 1.00 |
| Max. | 10.00 |
| Mean | 5.20 |
| SD | 3.29 |
| Var. | 10.84 |
| Count | 10.00 |

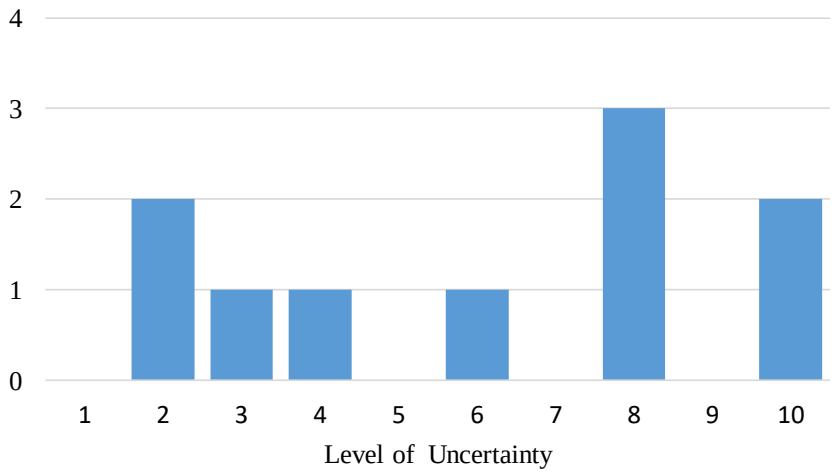
**Comment:**

**Delphi Statement 15**

**By 2030, consumers are willing to spend more money on sustainable food.**




| | |
|---|---|
| Min. | 1.00 |
| Max. | 10.00 |
| Mean | 5.60 |
| SD | 2.99 |
| Var. | 8.93 |
| Count | 10.00 |

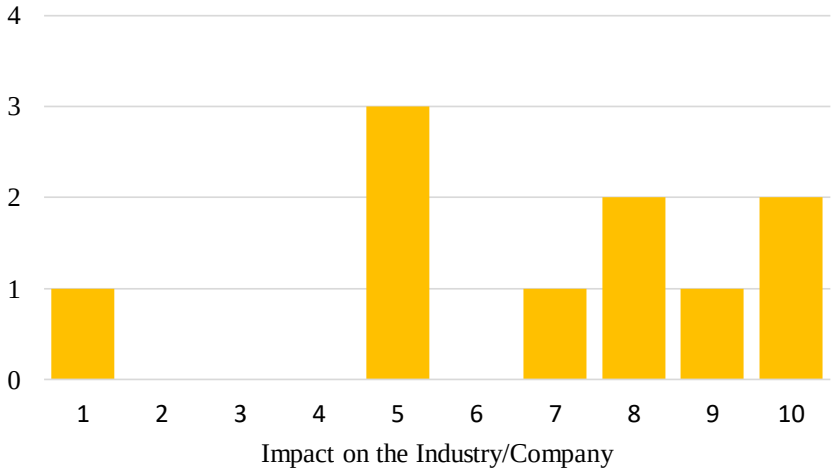



| | |
|---|---|
| Min. | 2.00 |
| Max. | 10.00 |
| Mean | 6.10 |
| SD | 3.14 |
| Var. | 9.88 |
| Count | 10.00 |

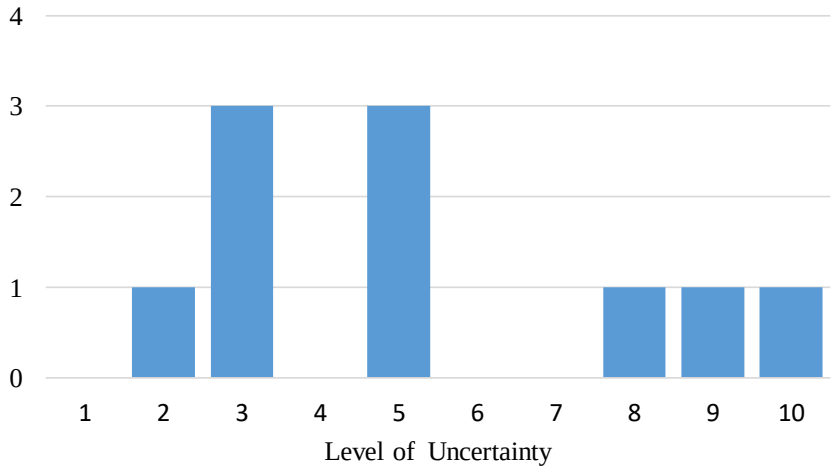
**Comment:**

**Delphi Statement 16**

**By 2030, the demand for food supplies will be higher than the supply.**




| | |
|---|---|
| Min. | 1.00 |
| Max. | 10.00 |
| Mean | 6.80 |
| SD | 2.82 |
| Var. | 7.96 |
| Count | 10.00 |

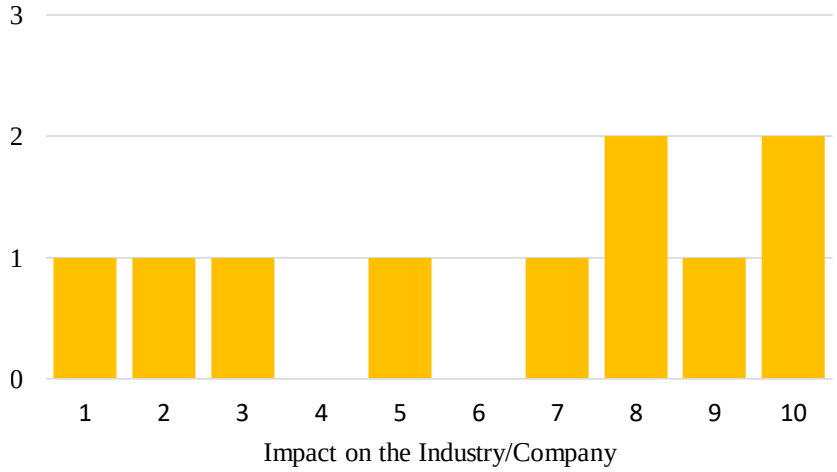



| | |
|---|---|
| Min. | 2.00 |
| Max. | 10.00 |
| Mean | 5.30 |
| SD | 2.79 |
| Var. | 7.79 |
| Count | 10.00 |

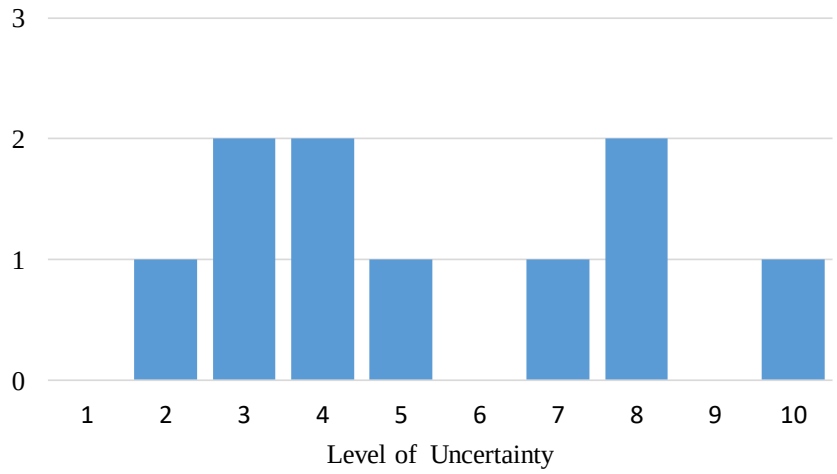
**Comment:**

**Delphi Statement 17**

**By 2030, the strictness of import regulations will increase, making cross border trade more difficult.**




| | |
|---|---|
| Min. | 1.00 |
| Max. | 10.00 |
| Mean | 6.30 |
| SD | 3.33 |
| Var. | 11.12 |
| Count | 10.00 |




| | |
|---|---|
| Min. | 2.00 |
| Max. | 10.00 |
| Mean | 5.40 |
| SD | 2.67 |
| Var. | 7.16 |
| Count | 10.00 |

**Comment:**