Strategic Market and Consumer Analysis: Unraveling the Potential for Insect-Based RTD Protein Drinks in Germany

Louis Wührl

Dissertation written under the supervision of Prof. Rute Xavier.

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ABSTRACT

This study embarks on a journey to explore the viability and potential of launching an insect-based Ready-to-Drink (RTD) protein drink in Germany. First, it navigates through an extensive analysis that weaves together secondary and primary data from a survey, providing a robust understanding of Germany's political, economic, sociocultural, and technological context. Next, it dives deeper into dissecting consumer preferences and scrutinizing the market's competition.

The investigation highlights a supportive political environment powered by robust sustainability initiatives, a blossoming interest in exploring alternative protein sources, and a vibrant sports culture embedded in the sociocultural fabric. It zeroes in on a niche yet promising market segment – individuals between the ages of 25 and 45 who frequently partake in sports activities and hold ethics and environmental sustainability close to their hearts. This group exhibits a high willingness to pay for insect-based protein drinks.

The competitive analysis relieves a conspicuous gap in the RTD sector, with no current players offering insect-based protein drinks. Furthermore, the protein industry as a whole, particularly the RTD sector, unfolds as a landscape with lucrative growth opportunities. However, a well-thought-out pricing strategy and comprehensive marketing efforts are crucial due to intense competition.

The study concludes that the insect-based RTD protein drink can be successful in the German market by focusing on communicating the unique benefits as part of a robust marketing strategy. It further signals the emergence of the online business model as a linchpin for success and a springboard for potential international expansion.

Title: Strategic Market and Consumer Analysis: Unraveling the Potential for Insect-Based RTD Protein Drinks in Germany

Author: Louis Wührl

Keywords: Alternative Protein, Competitive Landscape Analysis, Consumer Preferences, Market Entry Strategy, Pricing Strategy, Ready-To-Drink Protein Industry, Sports Nutrition, Strategic Market Analysis, Sustainability

SUMÁRIO

Este estudo leva-nos numa viagem cujo intuito é explorar a viabilidade e a possibilidade de lançar uma bebida proteica pronta a beber (RTD) à base de insetos na Alemanha. Primeiramente uma análise abrangente vai tecendo dados secundários e primários de um inquérito, oferecendo uma compreensão robusta do contexto político, económico, sociocultural e tecnológico da Alemanha. Numa segunda fase, o estudo adentra-se nas preferências do consumidor e na concorrência do mercado.

A investigação salienta um ambiente político favorável, sustentado por robustas iniciativas de sustentabilidade e um interesse florescente em explorar fontes alternativas de proteina, assim como uma cultura desportiva dinámica enraizada no tecido sociocultural. Foca-se num segmento do mercado promissor: indivíduos entre 25 e 45 anos que participam frequentemente em atividades desportivas e valorizam a ética e a sustentabilidade ambiental. Este grupo demonstra uma elevada disposição para pagar por bebidas proteicas à base de insetos.

A análise competitiva destaca uma lacuna notável no setor RTD, sem competidores atuais a oferecer bebidas de proteína à base de insetos. Contudo, a indústria de proteínas, especialmente o setor RTD, apresenta oportunidades de crescimento lucrativas, embora com intensa concorrência.

O estudo conclui que a bebida de proteína à base de insetos tem hipótese de ser bem-sucedida no mercado alemão, enfocando na comunicação dos benefícios especiais como parte de uma robusta estratégia de marketing e sinalizando a emergência do modelo de negócio online como fundamental para o sucesso e portanto um trampolim para a expansão internacional.

Título: Análise Estratégica de Mercado e do Consumidor: Desvendando o Potencial para Bebidas Proteicas à Base de Insetos Prontas para Beber na Alemanha

Autor: Louis Wührl

Palavras-chave: Análise da Paisagem Competitiva, Análise Estratégica de Mercado, Estratégia de Entrada no Mercado, Estratégia de Preços, Indústria de Proteínas Prontas a Beber, Nutrição Desportiva, Preferências do Consumidor, Proteína Alternativa, Sustentabilidade

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Louis Wührl

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TABLE OF CONTENTS

TABLE OF FIGURES

TABLE OF TABLES

LIST OF ABBREVIATIONS

B	Billion
BCG	Boston Consulting Group
CAGR	Compound annual growth rate
CPI	Consumer price index
CSR	Corporate social responsibility
IPP	Indifference price point
M	Million
NWI	Nominal wage index
OPP	Optimal price point
PMC	Point of marginal cheapness
PME	Point of marginal expensiveness
RTD	Ready-To-Drink
RWI	Real wage index
SAM	Serviceable available market
SEO	Search engine optimization
TAM	Total available market
US	United States
VIF	Variable inflation factor

CHAPTER 1: INTRODUCTION

1.1 Challenge

By 2050, the world's population is expected to increase by over 23%, reaching 9.7 billion people (United Nations, 2019). This development puts much strain on the current food production systems to fulfill the growing demand. Turning land to agriculture, acknowledged as one of the significant drivers of climate change, biodiversity loss, the depletion of freshwater resources, and the degradation of aquatic and terrestrial ecosystems, has historically been how humanity has attempted to address this problem (Springmann et al., 2018). The annual World Overshoot Day emphasizes addressing these negative trends and places pressure on preserving natural ecosystems (*World Overshoot Day 2022*, 2022). It marks the point at which humanity's resource consumption exceeds the Earth's capacity to replenish resources in a year. Since vegetarian and vegan diets typically use fewer resources, have a lower environmental impact than meat-based diets, and have a higher efficiency at which plant-based resources can be transformed into food, there has been an increase in interest in these diets in recent years. While alternative products like soybeans, peas, and wheat have been developed to replace protein-rich meat and fish, which are significant contributors to agricultural land conversion, they have successfully reduced some environmental impacts. However, producing these plant-based protein sources still requires substantial energy and chemical inputs due to the complex extraction processes needed to achieve higher protein concentrations (Lie-Piang et al., 2021). To address these challenges, individuals and businesses must continue to explore healthy, environmentally friendly, and resource-efficient options, including the often-overlooked possibility of insect-based products.

1.2 Business Idea

Insect consumption, driven by their abundance, high nutritional content, and versatility, is a time-honored tradition in many global regions, though cultural stigmas in Western societies have hampered acceptance. However, regulatory progress, such as the European Union's 2015 Novel Food Regulation, has heightened public awareness and acceptance of insects as a food source, subject to specific standards (European Commission, 2023). Moreover, with their low environmental impact and high protein content, insects offer a sustainable, nutritious alternative to conventional protein sources (Lynch et al., 2018).

This thesis explores the market potential of a startup introducing insect-derived Ready-To-Drink (RTD) protein beverages to the Western European market, focusing on Germany. This

innovation aligns with sustainability goals and the trend of a rapidly growing protein-rich RTD sector, particularly in the US, as per Grand View Research (2022). This startup aims to establish a profitable enterprise that simultaneously generates a positive impact on the environment, advocates for sustainable food production, and serves as a cornerstone for healthy dietary practices.

1.3 Problem Statement

A nutritionally balanced diet's cornerstone is consuming diverse foods in appropriate portions. A particularly crucial role is attributed to foods rich in protein, healthy fats, and minerals, such as those commonly found in meat and fish. However, since there is evidence of the significant impact of meat- and fish-based diets on the environment, the popularity of plant-based alternatives has been on the rise. Furthermore, resource scarcity and rising sustainability consciousness further support the unsustainable meat and fish production level. The livestock industry requires significant resources, and the associated farming and logistics negatively impact the environment (Grossi et al., 2019). Therefore, there is a need for sustainable alternatives to traditional meat and fish products that can address the growing demand for healthier and more eco-friendly diets while maintaining essential nutrients. Insects have emerged as a sustainable and healthy food option due to their high protein and mineral content and low environmental impact compared to traditional livestock. This has led to the emergence of startups and businesses focusing on producing and selling insect-based food products. However, the insect-based food industry in Europe is still in its infancy, and new market players are facing several challenges associated with this emerging market.

To address these challenges, firstly, this thesis intends to define and understand the market the business will operate in and characterize the competition. Secondly, it aims to identify the key drivers influencing customers' willingness to pay for insect-based protein drinks. Then, it uses them to break down the target group of consumers in Germany, define a clear pricing strategy, and assess the market size of RTD protein products. Finally, based on this information, it will be assessed if such a business can be viable and what it should focus on.

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CHAPTER 2: LITERATURE REVIEW

2.1 Market Analysis

2.1.1 Market Definition

The initial focus is to provide a deeper understanding of the business's market, which entails strategically evaluating the organization's internal and external circumstances. Further, this includes considering the broader macroeconomic context, such as economic growth, interest rate fluctuations, movements in currency, pricing of inputs, regulatory frameworks, and prevailing societal expectations regarding the corporation's role (Kaplan & Norton, 2008). The PEST analytical framework was initially conceived to evaluate the external macroenvironment that a business navigates. This tool facilitates an exhaustive examination of various influential factors, specifically political (P), economic (E), social (S), and technological (T) elements, providing a holistic understanding of the critical aspects of the market (Christodoulou & Cullinane, 2019). Applying the PEST analysis to assess the market environment is expected in the food and agricultural sectors. In 2014, the analysis was used as part of a study to determine macroeconomic factors of the organic food market in Turkey (Oraman, 2014). The article highlights the growing demand for organic food and the rising potential for developing countries to fill this gap. A critical aspect of the findings is the role of government policies that support the organic food industry’s growth. It also mentions the importance of establishing a legislative base and appropriate policy measures for organic farming, laying the political ground stone for a successful evolution of the organic food industry. However, despite identifying the increasing awareness of healthy living and environmental issues, the paper fails to further analyze the growing demand's clear motives, which is essential to determine the future demand's evolution.

Additionally, the market the paper focuses on is Turkey, which is not representative of the German market, so the discovered factors must be interpreted carefully. Nevertheless, the PEST framework can significantly impact identifying major macroeconomic factors, not just in the food sector. Also, in the sustainability sector, various articles have shown how to successfully use the framework as part of a methodology to uncover the main market drivers (Capobianco et al., 2021; Iacovidou et al., 2017).

Even though the PEST analysis is commonly employed in the food, agriculture, and sustainability sectors, its application in insect-based foods or proteins remains unexplored. One challenge might be the potential data limitations in specific areas, making it difficult to generate accurate and up-to-date data for all dimensions examined, mainly when focusing on particular

countries. This is the case in this analysis, with Germany being the target country. Moreover, the business environment is constantly changing, so the gathered information is static and does not account for future shifts in legislation, economy, or consumer behavior, meaning that data can quickly become outdated. An additional constraint of the PEST analysis is its sole emphasis on external factors, overlooking internal elements that characterize businesses and, as a result, the markets they operate in, including aspects like organizational culture, capabilities, and resources. Moreover, the framework does not consider the competitive dynamics essential for accurately delineating an industry and evaluating its competitive landscape and market attractiveness for new entrants.

2.1.2 Market Competition and the Importance of CSR

Examining the competitive landscape within the specific market is crucial to address this issue. The Boston Consulting Group (BCG) Growth-Share Matrix is a framework developed by BCG's founder Bruce Henderson. This matrix features two axes: the x-axis represents market share from high to low, and the y-axis represents growth from low to high. The matrix is divided into four quadrants: question marks (low market share and high growth), stars (high market share and high growth), cash cows (high market share and low growth), and dogs (low market share and low growth) (Henderson, 1970).

Based on this framework and the competitive analysis, Porter set the ground for an assessment focusing on external factors, analyzing the competitive landscape, and creating Porter's Five Forces framework (Porter, 1980). After that, many more scientists further explored this business area and enhanced it with their theories, one of which was Strategic Group Analysis. This is an approach wherein competitors are mapped within strategic groups to assess the market dynamics, enabling the firm to analyze the attractiveness of market opportunities (Harrigan, 1985). This method entails recognizing groups of companies that adopt similar strategies, such as focusing on identical market segments. Within this framework, it is essential to identify and examine all competitors concerning their target markets. An analysis of their product offerings and distribution models is required to obtain this information. Presenting this data in a tabular format ensures enhanced clarity and visibility.

Emerging from the landscape of competitive analysis, the focus turns to a noteworthy study published in the Strategic Management Journal. This study, conducted within China's manufacturing sectors, intricately investigates the interplay between market competition and

natural resource utilization (Duanmu et al., 2018). Its methodical approach, utilizing firm-level data and institutional theory, provides valuable insights that extend beyond China's geographical boundaries, allowing for extrapolation to other markets. Despite the distinct economic and environmental contexts between China and Germany, the study's findings carry substantial implications for the German insect protein market. It posits that intense market competition could accelerate natural resource depletion, raising sustainability concerns.

Conversely, it also illuminates the possibility of enhanced sustainable resource usage in markets characterized by monopolistic scenarios. However, caution should be exercised when directly applying these findings to Germany's insect protein sector. This is due to the unique characteristics of this sector and the study's primary emphasis on Chinese manufacturing sectors. Consequently, further research is necessary to validate these conclusions within the specific context of the German insect protein market. Nevertheless, the implications of these findings underscore the crucial role of Corporate Social Responsibility (CSR) in highly competitive markets. An unwavering commitment to CSR is paramount to sustaining progress and mitigating rapid resource depletion.

2.2 Business Model Implications

The business model concept is subject to various interpretations in scholarly literature. These perspectives range from viewing business models as inherent characteristics of actual firms to considering them as cognitive or linguistic constructs and as formal theoretical depictions encapsulating how a business entity functions (Massa et al., 2016).

2.2.1 Integrated Value Proposition

The business model's value proposition, traditionally centered on individual products or services and their benefits to the consumer, constitutes a crucial component. However, recent empirical studies, including an in-depth 20-year investigation into a leading supplier of die-casting machines in a fiercely competitive and dynamic industry, suggest this conventional perspective may be insufficient. Through extensive interviews and participant observations, the research underscores an emergent necessity to transition from isolated product systems to an ecosystem-oriented approach, more adequately reflecting the intricacies of the modern business environment (Stonig et al., 2022). As a result, firms need to adapt their business models to be part of a more comprehensive value ecosystem, in which an integrated value proposition

leverages the resources of all ecosystem members and hence provides a more compelling value proposition to customers and acts as a critical market differentiator.

In the case of the insect-based protein supplement startup, the main takeaway is the integration of the entire trajectory of the sustainable story behind both the product and the production into all product aspects and building relationships with partners who share the same values, ranging from possible cooperations with an organization that ensures sustainable farming, to the distribution of the final product via sustainability influencers.

2.2.2 Pricing Strategies

As a vital business model element, exploring different pricing strategies is paramount, influencing market position, future revenue, and profitability. While the Van Westendorp method is often criticized regarding its scientific validity for price analysis, some studies have substantiated its practical and academic relevance. A specific investigation applied this method to the cigarette market in Germany, affirming its effectiveness in determining price perception and consumer acceptance (Müller, 2005). Despite the peculiarities of the cigarette market, the study highlighted the method's reliability, albeit with limitations for predicting future market developments. The main constraints of this study are its focus on the unique cigarette market, characterized by high buying intensities and low-price variance, which inhibits a broad generalization of results to other markets.

2.2.3 Transition to an Ecosystem View

Mastering the transition from a product system to an ecosystem involves multiple strategic adaptions along the business model, from value proposition over value network to value architecture (Stonig et al., 2022). However, to fully leverage the effects of an ecosystem, it is essential to change from a firm-centric view to an ecosystem view, from individual product offerings to integrated solutions and linear value chains to networked value architecture. In this area, collaborations with other sustainable businesses, non-profit organizations, or local communities can create a shared value ecosystem and enable joint marketing campaigns, cross-promotions, or the co-creation of products that enhance the startup’s value proposition and contribute to the overall sustainability of the ecosystem.

CHAPTER 3: METHODOLOGY

3.1 Research Approach

The research methodology in this study incorporates both primary and secondary data sources to address the research questions presented in the paper effectively. Secondary data aim to provide a solid foundation of existing knowledge and insights, mainly related to the market situation of the insect-based protein and general protein drink market in Germany. The main objective of collecting primary data through a survey is to obtain trustworthy, first-hand information that complements and extends the secondary data and provides deeper insights into German consumers' attitudes, preferences, and potential behavioral patterns toward insect-based protein supplements.

3.2 Secondary Data

This study's secondary data is from academic articles, news and company publications, and industry reports. These sources comprehensively understand various management theories relevant to startup creation, market analysis, and consumer preferences for insect-based protein supplements and the RTD sector. Furthermore, critical data from competitor websites and industry reports enable an in-depth market analysis. These resources also facilitate a thorough competitor analysis, the evaluation of market positioning, the development of realistic pricing strategies, and identifying best practices in the market. The secondary data analysis forms a solid foundation for this research, enriching the methodology by offering context and additional support for the primary data collection.

Conducting the competitor’s analysis identified complexities and heterogeneities of the German market for insect-protein supplements. It necessitated a systematic exploration, encompassing rigorous perusal of nutritional tables and pricing structures. Each competitor's product was meticulously scrutinized - with the prices centered around a unitary framework, permitting more refined comparisons. Discounts linked to bulk purchases were set aside, with a single unit price holding the analytical spotlight.

Intricate it may be, but the pulse of online presence had to be gauged too - an endeavor burdened by the lack of accessible data on conventional company size indicators like revenues and employee count. So, an innovative route was charted, weaving together followership on social media platforms like Instagram and TikTok and a deep dive into web metrics.

Data from 'similarweb.com' proved a lighthouse in this ocean of information, highlighting website visit durations, average pages per visit, and the elusive bounce rate. Points were allocated following a rank-based system, breathing life into a new, albeit approximated, metric of an online presence. The highest follower count or page visits scored the maximum points, with bounce rates bucking the trend, awarding the lowest rates instead.

Each variable contributed to the final tally, but Instagram followership and website visits claimed double weightage, their importance undeniably accentuated. Finally, these collective scores were juxtaposed with the theoretical maximum, morphing into percentages that encapsulated the essence of each competitor's online stature.

This methodology, though unorthodox, was crafted in a sophisticated whirl of perplexity, intertwining the BCG Growth-Share Matrix's approach with the Strategic Group Analysis's viewpoint. Amidst its manifold complexity, this approach provided an illuminating portal into the comparative dimensions of competitors, a landscape often shrouded by the inaccessibility of conventional metrics.

3.3 Primary Data

The primary research for this study was conducted through a comprehensive survey to delve deeper into the main drivers behind consumers' preferences for insect-based protein supplements in the German market and to gather sensitive data about the price consumers would be willing to pay for an insect-based protein drink. This survey, conducted on the Qualtrics platform, was carefully structured to separate respondents by fitness level, dietary habits, perceptions of insect-based foods, and demographic characteristics. In a first analysis of existing literature on factors that influence the acceptance of insect-based food, the study of Hartmann in 2015 identified some of the crucial determinants for the consumer's liking of insect-based products. The variables used in this work's primary analysis strongly orientate these findings, enhancing them with insights from other literature.

3.3.1 Survey Design

At the survey's outset, non-residents of Germany were excluded to solely focus on the opinions of the German market concerning insect-based protein supplements. Subsequently, participants' physical activity levels were examined as an essential factor influencing the need for protein

supplements. Although existing literature on insect-based food did not extensively explore these factors, a potential association between physical activity and sports supplement consumption is evident.

The subsequent survey section explored respondents' dietary preferences, eating habits, and primary protein sources. Additionally, their motivations for dietary choices, openness to novel foods, overall health consciousness, and disgust sensitivity were assessed to gain a comprehensive understanding of their dietary behaviors. These variables were derived from the factors analyzed in Hartmann's 2015 study.

An informative survey segment introduced the potential benefits of insect-based foods, particularly regarding resource efficiency and nutritional value. Respondents were then asked to express their agreement or disagreement with the assertion that insect-based proteins could be advantageous for human consumption. Their past experiences with consuming insects, the significance they attributed to product packaging, the emotions associated with eating insects, and their willingness to pay for a hypothetical insect-based protein drink were also explored.

The final survey section collected demographic data, including gender, age, place of residence, education, occupation, income, and marital status. This information is crucial for identifying patterns and trends across different demographic groups.

3.3.2 Survey Distribution

The survey was disseminated via two main channels and launched in different time frames. Firstly, direct messages to known contacts, including family, friends, and students, accounted for approximately 30% of the responses collected. Secondly, the remaining 70% of responses were acquired through the professional online survey platform ‘clickworker.com’. This platform facilitated access to a varied pool of potential respondents and allowed for adjustments to the respondents' backgrounds, ensuring a more representative sample of the German population.

To ensure the integrity of the responses, measures were implemented to prevent individuals from completing the survey more than once. This was achieved by tracking IP addresses, which allowed for identifying and excluding duplicate responses.

Initially, the survey was predominantly completed by individuals between 25 and 34, mainly due to the direct messaging approach primarily targeting students. However, to achieve a

balanced and representative sample, the online survey platform was subsequently used to broaden the age and gender distribution of respondents. As a result, the remaining quota was filled with participants from other age groups, focusing on older respondents, ensuring a comprehensive, accurate, and representative understanding of consumer attitudes toward insect-based protein supplements.

3.3.3 Statistical Survey Analysis

3.3.3.1 Data Preparation

A total of 346 responses were received. Of these, four participants were excluded because they did not reside in Germany. Further quality control was provided by an attention-check question asking participants to select a specific response. Fifteen respondents did not answer this question correctly, indicating a lack of attention to the survey instructions, and their responses were therefore excluded from the data set. In the section asking respondents to indicate their willingness to pay for the insect-based protein supplement, three respondents inserted non-numeric characters in the open text box. Their responses were also considered invalid and removed from the analysis. Five additional responses were excluded because their reported average willingness to pay was considered an outlier. These were determined by values of more than four standard deviations from the mean, suggesting either an error or a very atypical willingness to pay.

A total of 27 responses were excluded for the aforementioned reasons. Consequently, the final sample size for analysis was adjusted to 319, ensuring the validity and reliability of the survey data used for further analysis in this study.

3.3.3.2 Analysis Approach

The R Studios software was employed to conduct exhaustive data analysis. As most variables conformed to a 5-point Likert scale, they were predominantly categorical, except for the willingness to pay. These variables were subsequently converted into factor variables, or in certain isolated circumstances, dummy variables, to facilitate comprehensive analysis.

The next phase of the investigation concentrated on the dependent variable, the average willingness to pay. In the survey, respondents were requested to propose four distinct price points for a hypothetical 330ml high insect-protein drink containing 25 grams of protein. Given

the industry standard protein quantity, the focus of the hypothetical drink can be succinctly streamlined toward the concept of insects as primary ingredients. These price points represented a value deemed excessively low, causing doubts about the product's quality, a low but reasonable price, a high but justifiable price, and an overly high price. Since these individual price points were exclusively required for the price calculation of the product based on the Van Westendorp method, for the regression analysis, an individual mean of these suggested values was calculated for each response, creating a new variable named Average Willingness to Pay.

A critical step in the analysis was verifying this dependent variable's normal distribution. This is an essential prerequisite for regression analysis, assuming the dependent variable is normally distributed. Visual plots and the Shapiro-Wilk normality test were utilized to examine this distribution. The test yielded a value of 0.973 for the initial distribution of the average willingness to pay, which was statistically significant at the 1% level. This outcome indicates a close approximation to a normal distribution, whose perfect representation would be a value of 1.00.

An attempt was made to refine the data further and achieve a more normal distribution for the average willingness to pay by manually adjusting outliers using the Winsorizing method. The mean and standard deviation of the average willingness to pay was computed, giving values of 1.92 and 0.82, respectively. The Winsorizing method was then applied to modify any values exceeding three standard deviations from the mean, adjusting them to match the value precisely three standard deviations from the mean. Two such instances were identified, initially with values of 4.85 and 4.50, which were manually adjusted to 4.38 (=1.92+3×0.82). This adjustment was recorded in a new variable, the *Corrected Average Willingness to Pay*. A subsequent Shapiro-Wilk test was applied to this new variable, yielding a marginally improved result of 0.975, also significant at the 1% level.

Following the adjustments to ensure a near-normal distribution of the dependent variable, the analysis investigated the interplay of explanatory variables. Ensuring the absence of multicollinearity is vital, a phenomenon where independent variables exhibit strong correlations, complicating the isolation of their individual effects on the dependent variable.

Cramer's V, a measure of association between two nominal variables providing a value between 0 (no association) and 1 (perfect association), was used to examine the relationships among the explanatory variables. Since correlation matrices cannot accommodate categorical variables, the associations were examined using Cramer's V and corresponding p-values.

The findings indicated a moderate-to-strong association between the intensity and frequency of sports, with a Cramér's V value of 0.57, significant at the 1% level. Similarly, a moderate-to-strong association was observed between sustainability and ethical motivations for diet choice, with a Cramer's V value of 0.52, also significant at the 1% level. Furthermore, an association between weight and cultural motives for diet choice was recorded, with a Cramer's V value of 0.35, significant at the 5% level. Lastly, an association between age and education was observed, with a Cramer's V of 0.45, significant at the 10% level.

Further examination for multicollinearity was conducted using the Variance Inflation Factor (VIF), which assesses the severity of multicollinearity in an ordinary least squares regression analysis. The intensity of sports and the frequency of sports emerged as aliased coefficients, indicating perfect multicollinearity. A VIF of 5.8 was computed for sustainability and ethical motivations for diet choice, suggesting a moderate degree of multicollinearity. A VIF of 2.2 was found between weight motivation and cultural motives, indicating a lower yet detectable level of multicollinearity. Finally, a high VIF of 16.7 was observed between age and education, signifying a solid presence of multicollinearity.

Considering these findings, the variables relating to sport intensity, education, and cultural motive were omitted from the regression analysis to mitigate the impact of multicollinearity. The regression analysis was then conducted with the remaining explanatory variables. Subsequently, a stepwise regression method was employed to remove insignificant variables and evaluate the changes in the adjusted R-squared. If the adjusted R-squared increased, the variables were included; if it decreased, they were excluded.

Observations	319
R2	0.386
Adjusted R2	0.254
Residual Std. Error	0.702 (df = 262)
F Statistic	2.936*** (df = 56; 262)
Note:	*p<0.1; **p<0.05; ***p<0.01

Figure 1: Summary of the regression analysis

(Source: Survey data)

As shown in Figure 1, the model was constructed using 319 observations. An R-squared value of 0.386 was determined, suggesting that the model could explain approximately 38.6% of the variation in the dependent variable. However, considering the number of predictors in the model, the adjusted R-squared was 0.254, a lower figure that signifies a moderate level of explanatory power. The Residual Standard Error, which signifies the average amount that the

response will deviate from the actual regression line, was found to be 0.702 (df=262). This indicates a relatively decent fit of the data points around the model's predictions.

Additionally, the model resulted in an F Statistic value of 2.936 (df=56; 262), which was highly significant at the 1% level, suggesting the overall significance of the model.

However, it should be noted that while the model has some explanatory power, a substantial portion of the variance in the dependent variable remains unexplained. Therefore, while the model provides valuable insights, additional factors not included in this model might also influence the dependent variable, and further research is needed to improve the model's explanatory power.

3.3.3.3 Descriptive Statistics of the Survey Sample

A closer examination of the sample reveals a slight gender imbalance, with male respondents (185 in total) outnumbering their female counterparts (134 in total).

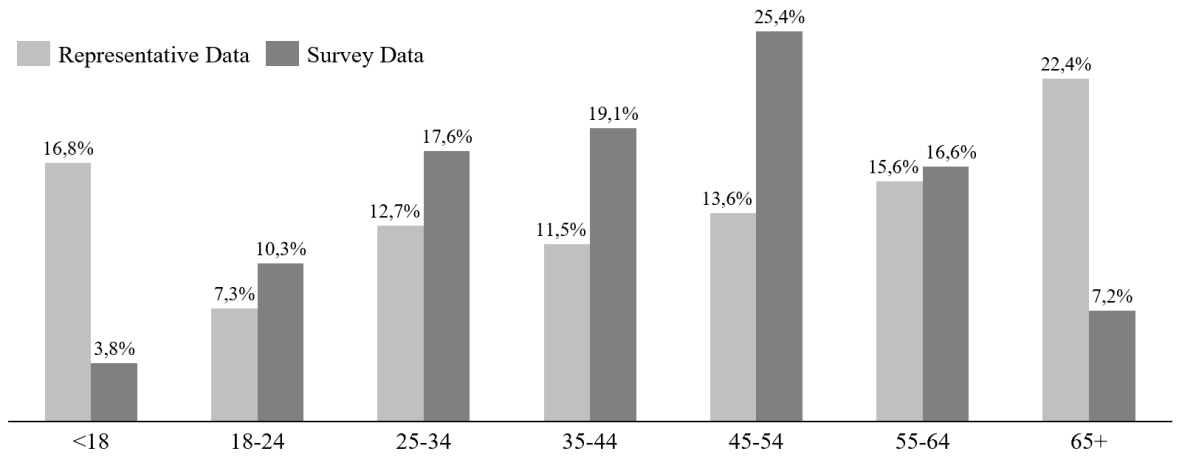

Figure 2: Age distribution

(Source: Adapted from Statista, 2022; Survey data)

As shown in Figure 2, the comparison of the age distribution within the sample and recent demographic data about the age distribution in Germany from Statista highlights a predominance of respondents aged between 25 and 54. However, there is a noticeable underrepresentation of participants aged below 18 and above 65. Another noteworthy observation is the age difference between genders, with the average age of female respondents falling within the 25-34 bracket. In contrast, the mean age for male respondents is higher, ranging between 35 and 44.

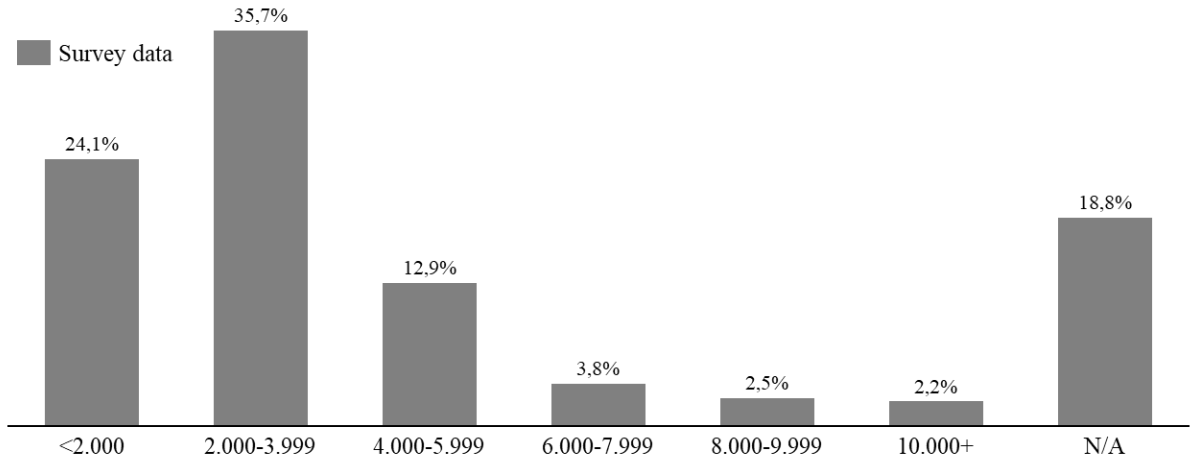

Figure 3: Monthly net household income

(Source: Survey data)

Turning to monthly net household income, the distribution varied significantly, as shown in Figure 3. Most respondents (35.7%) reported a monthly income within the 2,000-3,999 € range. The second largest group (24.1%) earned less than 2,000 €. Beyond this point, the percentage of respondents began to diminish, with 12.9% earning between 4,000-5,999 €, 3.8% within the 6,000-7,999 € bracket, 2.5% earning between 8,000-9,999 €, and a mere 2.2% boasting incomes exceeding 10,000 €. It is important to note that 18.8% of respondents chose not to disclose their net household income.

Concerning dietary preferences, the sample was predominantly omnivorous (60.5%), followed by flexitarians (22.9%), vegetarians (10.7%), pescatarians (3.4%), and vegans (2.5%).

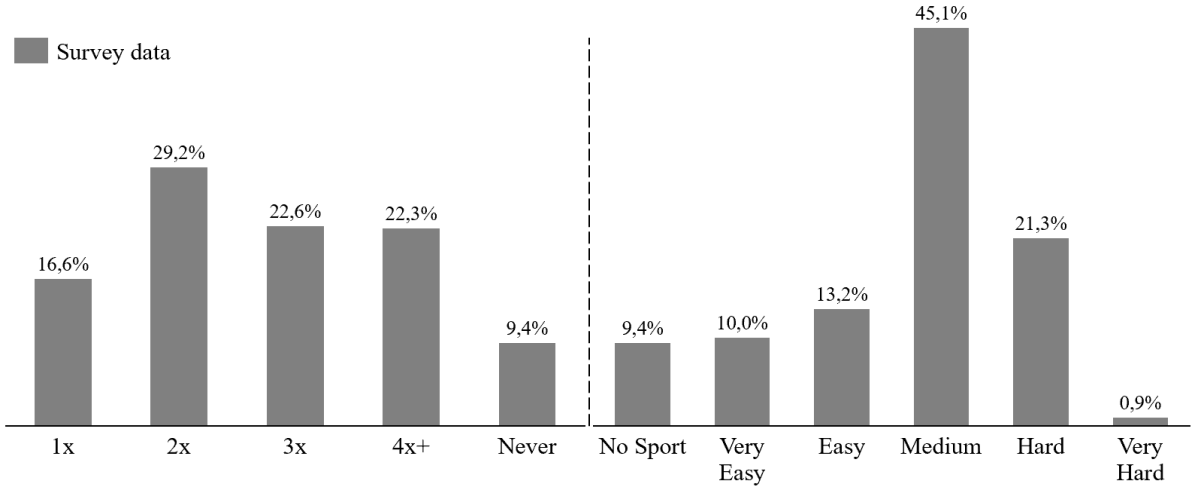

Figure 4: Frequency (left) and intensity (right) of weekly physical activities

(Source: Survey data)

Regarding physical activity, as shown in Figure 4, the respondents were predominantly active, with a mere 9.4% confessing to a sedentary lifestyle. The rest of the sample was split amongst those who exercise once a week (16.6%), twice a week (29.2%), three times a week (22.6%), and those who engage in physical activity four or more times a week (22.3%).

The exercise intensity varied across the sample, with 10% participating in low-intensity activities such as stretching and walking and 13.2% opting for slightly more demanding exercises like yoga, pilates, and light swimming. The majority (45.1%) fell into the medium intensity bracket with activities like Nordic walking, Zumba, aerobics running, or cycling. A smaller percentage (21.3%) engaged in high-intensity workouts such as intensive interval training, heavy gym exercises, sprints, spinning, and high-intensity swimming, with a tiny portion (0.9%) performing demanding sports akin to professional athletes.

CHAPTER 4: Data Analysis

4.1 Market Analysis

4.1.1 PEST Analysis

4.1.1.1 Political Factors

The burgeoning insect farming industry sits heavily under the influence of political dynamics. Regulatory edicts such as Germany's Novel Food Regulation lay down critical guidelines regarding the legal usage of insects as a consumable source, molding the industry's topography.

As of 2021-2022, an array of insect species, including yellow mealworms, migratory locusts, and house crickets, have been greenlit for marketing and utilization in various forms in the EU (European Commission, 2023). This development is a significant stride for insect-based food producers, initiating novel product innovation and market expansion routes.

Amongst the actors in the political arena, Germany and the Netherlands claim significant roles in the European context, now rivaled by the emerging Vietnamese player, CricketOne.[1] A substantial development is the European Food Safety Authority's endorsement of CricketOne's defatted house cricket powder, making them the inaugural non-EU manufacturer authorized to supply cricket protein-based products (Turck et al., 2022).

This development casts a vast shadow over international trade dynamics. The complex process of insect farming could potentially boost the import of essential resources (Madau et al., 2020). Conversely, an increase in domestic production, particularly in Germany, might increase the export of German-developed insect farming technologies. However, this conjecture is based on myriad interrelated factors shaping the global insect farming market.

The shifting dynamics between domestic production and global trade flows, framed by regulatory approvals, continuously reshape the insect farming industry. Thus, stakeholders must vigilantly monitor these changes.

Meanwhile, the German government is implementing measures for sector enhancement, such as refining labeling rules, debating allergen labeling, and providing financial support to startups (German Bundestag, 2023). These could foster transparency and incentivize market entrants, albeit with additional producer obligations.

[1] Competitor's analysis, to be discussed in greater detail in a subsequent section of this work, indicates a predilection for the establishment of insect farming operations in Germany and the Netherlands

Conclusively, political factors, including regulatory, trade policies, and government initiatives, are the linchpins of Germany's insect farming industry. As dynamics evolve, keeping abreast is crucial for present and aspiring operators.

4.1.1.2 Economic Factors

Economic factors in the insect-protein startup sphere wield significant transformative impacts, especially amidst major shifts like Germany's changing wage landscape.

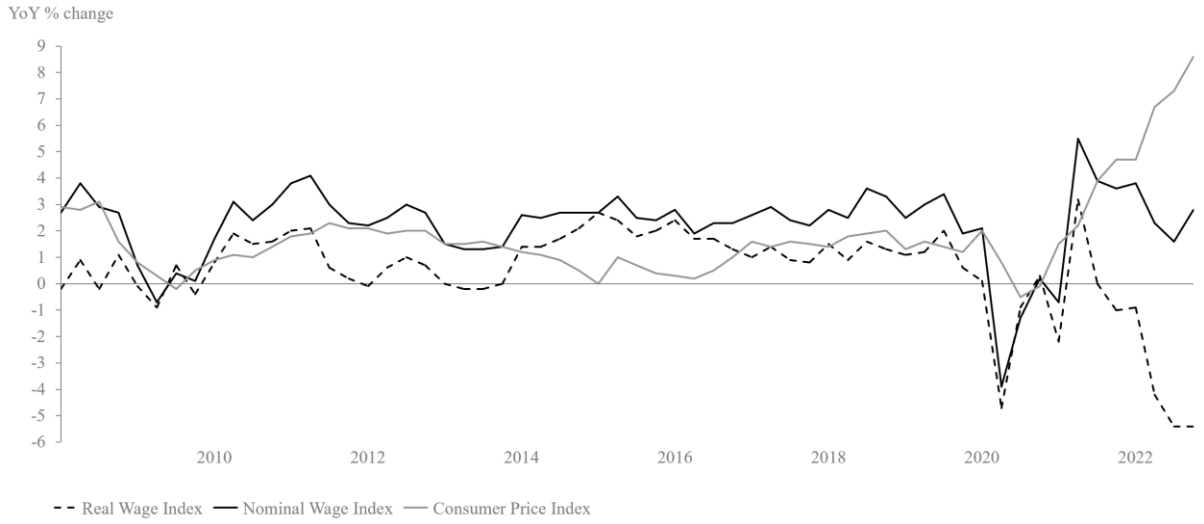

Figure 5: Development of nominal and real wage index and consumer price index

(Source: Adapted from Federal Office of Statistics, 2023)

Figure 5 data reveals a 2.6% rise in Germany's nominal wages from 2021 to 2022, contrasted with a 4.0% drop in real wages. This decline mirrors the trend over the previous years, attributed to a 6.9% hike in consumer prices, diminishing the purchasing power of the average German consumer.

Such macroeconomic dynamics directly influence disposable income for wellness products like insect-based protein supplements. While nominal wage growth may imply an increased spending capacity, real wage trends tell a different tale, further strained by the economic repercussions of the global COVID-19 pandemic.

Aligning prudent pricing and marketing strategies with consumers' adjusted purchasing power is pivotal amidst this income squeeze. However, the future of real wages and purchasing power remains speculative, affording strategic flexibility.

The interplay of economic factors on startups, mainly those reliant on international trade, is intricate. For instance, a depreciating Euro could spike production costs, possibly impacting market demand, particularly against declining real wages (Harberger, 1950). Such an environment underscores the need for startups in the insect-based protein sector to remain vigilant about exchange rate dynamics, given their potential to affect both the cost of imports and international competitiveness.

On the contrary, a robust Euro can potentially relieve cost pressures, enhancing competitiveness for startups with a global outlook. Despite this, the scarcity of resources, such as farmed insects, may challenge flexibility in import strategies.

Focusing on location-specific tactics, options like Germany or the Netherlands for insect farming emerge as viable, insulated from exchange rate fluctuations. Alternatively, import-reliant businesses, such as that sourcing from CricketOne in Thailand, face profit-margin risks due to exchange rate volatility (European Central Bank, 2023). Therefore, these entities might consider financial instruments like futures or options for safeguarding against undesirable shifts in the currency market.

In conclusion, amid economic flux, the insect-protein startup sector must remain vigilant and adaptable. The impact of declining real wages on purchasing power could affect demand for wellness products like insect-based protein supplements, making it essential for businesses to evaluate their pricing and marketing strategies continually. Despite relative exchange rate stability, constant monitoring and implementing risk-management strategies are crucial for these startups to navigate potential future fluctuations and maintain economic viability.

4.1.1.3 Social Factors

On the one hand, nutritionally rich and environmentally sustainable insect-based protein drinks face hurdles in a Western market like Germany due to ingrained consumer attitudes toward insect consumption (Kauppi et al., 2019). This psychological barrier, often called the ‘yuck’ factor, could significantly challenge market penetration (Schmidt, 2008). However, food choices are susceptible to sociocultural influences, as evidenced by the broadening gastronomic palette of the Western consumer in recent decades (Monterrosa et al., 2020). Therefore, the key lies in effective marketing that can illustrate insect protein drinks' health benefits and novel culinary experiences, ultimately normalizing their consumption.

On the other hand, the rise of health and fitness trends could play to the startup's advantage (Deloitte, 2023). The increasing demand for alternative protein supplements has been driven by a growing population of health-conscious consumers, fitness enthusiasts, and athletes (Bashi et al., 2019). With its high protein content, the insect-based protein drink could thus find a willing market among these consumers, provided its health benefits are appropriately communicated.

Additionally, the growing consumer awareness about the environmental impact of their food choices presents an opportunity for sustainable protein sources like insects (Lusk & McCluskey, 2018). The sustainability angle of the insect protein drink, with its low carbon footprint and minimal resource use compared to traditional livestock protein, could be leveraged to attract environmentally conscious consumers.

Thus, while there are perceptual barriers to overcome, the current social trends related to health and sustainability could be opportune for growing and accepting insect-based protein drinks in the German market.

4.1.1.4 Technological Factors

In the insect-based protein sector, technology unfolds as a transformative force. The potential of automation and high-tech systems in insect farming is poised to enhance production efficiency and sustainability. Furthermore, refined within aquaculture and livestock sectors, insect farming machinery paves innovation paths (van Huis & Gasco, 2023). Harnessing such advancements, startups can thrust themselves onto the forefront of the insect-based protein landscape.

Simultaneously, the profound influence of e-commerce should not be overlooked. The pandemic-induced surge in digital transactions, particularly in the food sector, necessitates effective online strategies to ensure prominence in an increasingly competitive digital marketplace (Din et al., 2022). Utilizing robust search engine optimization (SEO) practices and digital marketing strategies can increase product visibility, amplify reach, and, potentially, consumer engagement (Andonov, 2020).

Food tech advancements also herald new horizons for this sector. Given the proliferation of companies focusing on alternative protein sources and the unprecedented volume of patents filed in the food industry, there is significant scope for mutually beneficial collaborations (Otero et al., 2022). The merger of lab-grown or plant-based protein technologies with insect proteins

presents an intriguing proposition. It could yield a diversified product range, offering consumers innovative and sustainable protein options.

The coalescence of these technological dimensions is pivotal for startups in this sector, shaping their operational efficiencies, market positioning, and competitive edge. As technology evolves, remaining vigilant about the potential benefits and strategic alignments it offers is vital.

4.1.1.5 PEST Analysis Summary

Germany's insect-protein market, guided by evolving political regulations and trade policies, is influenced by a challenging economic landscape with changing real wages impacting consumer purchasing power. In addition, social trends show increasing health consciousness and sustainability awareness, leading to shifting attitudes toward insect-based protein, presenting both challenges and opportunities: technological advancements and governmental initiatives fuel sector growth. Strategic adaptation to these factors can unlock significant opportunities in this market despite complexities.

4.1.2 Competitor’s Analysis

4.1.2.1 Competitor’s Overview and Products

An exhaustive, systematic research methodology was executed in pursuit of an incisive understanding of Germany's nascent insect protein market's competitive terrain. Leveraging a spectrum of reputable repositories, specifically industry reports and the digital footprints of involved companies – cornucopias of both qualitative and quantitative data – the research undertook more than just uncovering potential competitors; it sought to shed light on the intricacies of the market's underlying structure and its inherent variability.

4.1.2.1.1 Insect-Protein Sector

Table 1: Overview of insect-food brands operating in Germany

(Source: Competitor's Analysis)

Brand Name	Protein-Focused Product Portfolio
Benito Foods	Pasta
Catch-Your-Bug	Powder, Bars, Snacks, Whole Insects
Entofriends	Burger
Essento	Bars, Snacks, Whole Insects
Jimini's	Bars, Granola, Pasta, Cracker, Whole insects
MyBugBar	Powder
Party Bugs	Powder, Snacks
Prime Insects	Powder, Bars, Snacks, Whole Insects
Sens	Powder, Bars, Snacks, Granola, Whole Insects
Snack Insects	Powder, Bars, Snacks, Whole Insects
Zirp	Powder, Bars, Snacks, Cooking

As shown in Table 1, the extended analysis threw into relief a kaleidoscope of enterprises, each underscoring a unique strategic thrust and product assortment. Acknowledging the coexistence of market specialists and generalists, a discernible market pattern is noteworthy. Entities like Benito Foods, Entofriends, and MyBugBar have meticulously sculpted their operational focus to a particular product category – protein pasta, protein burger, and protein powder, respectively. This strategic narrowing could be a tactical gambit to dominate a specific market slice. While maintaining a degree of interpretative flexibility, it subtly illuminates the potential reservoir of opportunities embedded within the German insect-protein market. This facet might appeal to fledgling startups, especially those yet to branch out into diverse product development.

Conversely, strongly diversified companies such as Sens and Jimini’s manifest a more expansive strategy, curating a broad palette of offerings. Such an approach ostensibly targets a broader customer swathe, signifying an orientation toward breadth rather than depth.

This divergence in business stratagems across the competitive landscape underscores the multifarious character of the insect protein market in Germany. Thus, a budding startup in this domain must comprehend these dynamics as a bedrock for delineating its unique niche and strategy.

4.1.2.1.2 RTD Sector

The focus was expanded beyond insect-based offerings to delve deeper into the German landscape of the RTD protein drink industry. This exploration was deemed pivotal due to the prospective nature of the nascent startup's envisioned product: an insect-based protein drink. Given the dynamism and flux prevalent within this industry, the specter of established heavyweights broadening their scope to embrace insect protein or smaller entities specializing in this future-facing niche is a plausible scenario.

As part of the research, both protein shake providers and purveyors of meal replacement drinks were examined. In both categories, there is currently a glaring absence of insect-based protein options. However, intriguingly, the properties inherent to insects, mainly their high fiber content courtesy of chitin, could make them an ideal fit for inclusion in meal replacement beverages.

Table 2: Overview of protein-related beverage brands operating in Germany

(Source: Competitor's Analysis)

Brand Name	Product Type	Protein Source	Price in € per 10g Protein
Barebells	Protein Shake	Whey	0.93
Prozis	Protein Shake	Whey	0.86
Optimum Nutrition	Protein Shake	Whey	1.09
Wieder	Protein Shake	Whey	1.07
Multipower	Protein Shake	Whey	1.00
PowerBar	Protein Shake	Whey	0.99
BodyAttack	Protein Shake	Whey	0.70
Ehrmann	Protein Shake	Whey	0.80
Layenberger	Protein Shake	Whey	0.90
Power System	Protein Shake	Whey	0.81
Milbona	Protein Shake	Whey	0.21
Müller	Protein Shake	Whey	0.77
Unmilk	Protein Shake	Pea	1.16
Barebells	Meal Replacement Drink	Whey	0.97
Layenberger	Meal Replacement Drink	Whey	1.83
Y-Food	Meal Replacement Drink	Whey or Soy	1.47
ManaDrink	Meal Replacement Drink	Soy, Pea, Oat	2.23
Huel	Meal Replacement Drink	Pea	1.93
Saturo	Meal Replacement Drink	Soy	1.60
Jimmy Joy	Meal Replacement Drink	Soy	1.73

Table 2 encapsulates a snapshot of the brands analyzed, their respective product types, and the source of protein used. Upon scrutiny of the data, a clear pattern emerges - a strong dominance of whey protein in the protein shake segment. The roster of brands - Barebells, Prozis, Optimum Nutrition, to name a few - consistently turn to whey as their protein source of choice.

However, the meal replacement drink space does not lean as heavily toward conventional protein sources as the protein drink sector. Instead, most brands offer drinks with alternative protein sources, such as soy, pea, and oat protein.

Given the conspicuous lack of variety in protein sources in the protein drink sector, it seems ripe to introduce innovative alternative sources. This realization illuminates an uncharted path with opportunities for a budding enterprise in the insect protein space. Recognizing and understanding these intricacies could provide the cornerstone for defining its unique niche and crafting an effective market strategy. Furthermore, a bold step into the fray with a differentiated offering, such as an insect-based protein drink, could disrupt the prevailing status quo, redefining the sector's trajectory in Germany.

4.1.2.2 Pricing Strategies

A systematic investigation unveils intriguing complexities in competitors' pricing strategies within the insect protein and the protein drink and meal replacement market. In the grand chessboard of market dynamics, these companies astutely maneuver their pricing to mirror various factors, namely market conditions, brand positioning, and integral production costs. Such maneuvers weave an intricate tapestry of price differentiation, creating a compelling landscape for academic exploration.

4.1.2.2.1 Insect Protein Market

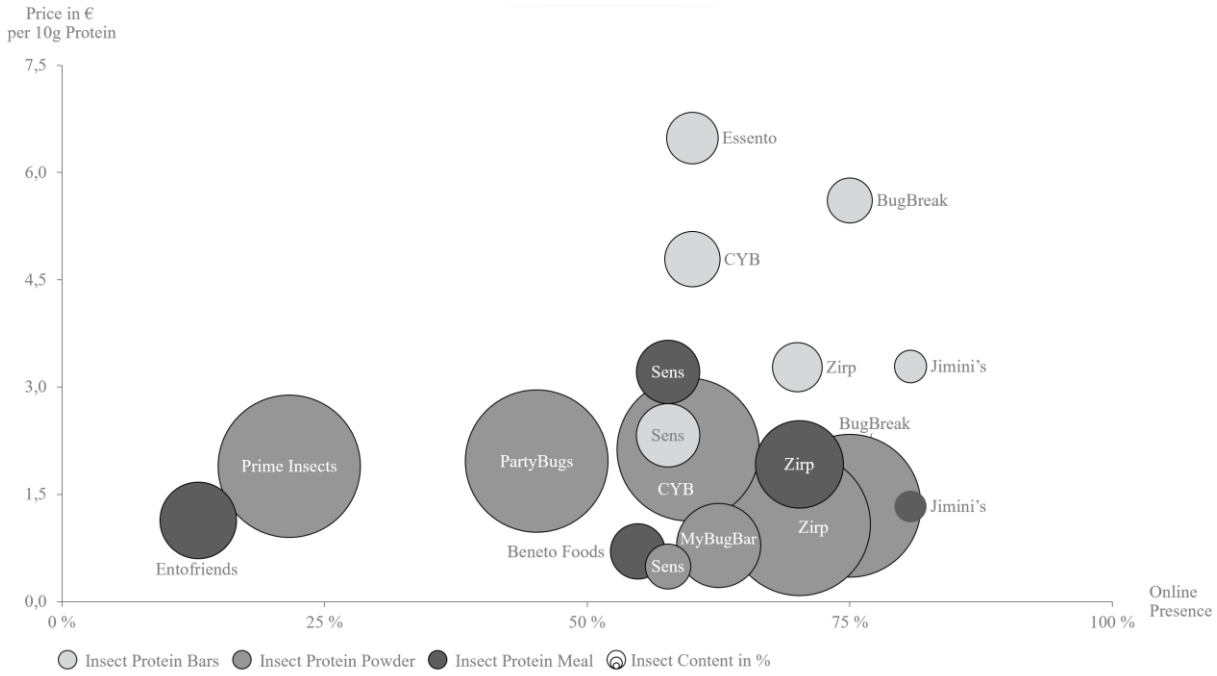

Figure 6: Market assessment: Insect-based protein products in Germany

(Source: Competitor's Analysis)

Figure 6 highlights the price per 10g of protein on the y-axis and the online presence, assessed as described in Chapter 3, on the x-axis. The size of the bubbles displays the respective insect content, in percentage, that each of the analyzed products has.

In the case of the insect protein bar segment, a curious pricing puzzle can be noticed. Despite Sens boasting the highest insect content at a substantial 20%, it breaks the mold by offering the least cost per 10g of protein – a mere 2.33 €. In stark contrast, Essento, with a similar insect content of 13%, levies the steepest price of 6.48 € per 10g of protein. This discrepancy suggests Essento's employment of a premium pricing strategy, presumably to project a superior product image.

A shift to the protein powder sector unveils an evolving narrative. Amidst a cluster of competitors boasting a pure 100% insect content, only MyBugBar and Sens appear to navigate an alternate path, with insect contents of 35% and 10%, respectively. For the rest, price points hover between Zirp's affordable 1.08 € and Catch-Your-Bug's more substantial 2.13 €. The elevated pricing by Catch-Your-Bug could be attributed to the firm's unique position of producing and farming insects domestically in Germany. Furthermore, given the high wage structure in Germany, the cost implications might necessitate adopting a cost-plus pricing strategy, thereby justifying the higher price.

Delving into the domain of insect protein meals unravels another layer of complexity. Benito Foods offers the lowest price of 0.70 € per 10g of protein, despite holding a respectable 15% insect content. On the other hand, Sens, with an augmented insect content of 20%, demands the highest fee, substantially outpacing its nearest competitor by a price difference of 1.29 €.

Notably, in the case of Sens, the company embraces a versatile pricing approach across its product portfolio. Despite offering the highest insect content, its protein bar astonishingly comes with the lowest price per 10g of protein. Sens' protein powder follows a similar trend commanding the lowest price within its category, albeit featuring the lowest insect content of 10%. It appears that Sens may be striving to gradually acclimatize consumers to the concept of insect-based proteins through their entry-level products, the protein bar and protein powder. Once consumers are acquainted with this unique offering, Sens introduces them to their premium product line, protein meals, in which they apply the skimming pricing strategy targeted toward more affluent, health-conscious consumers willing to pay a premium for what they perceive as superior products.

4.1.2.2.2 Protein Drink and Meal Replacement Drink Sector

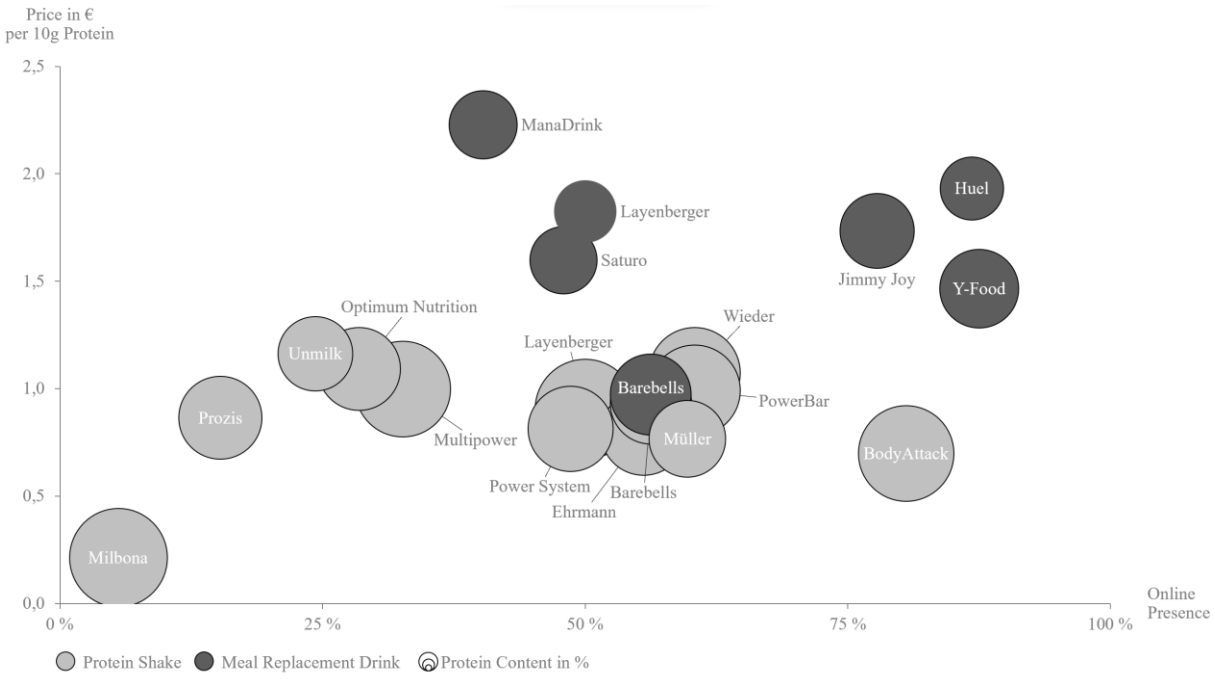

Figure 7: Market assessment: Protein and meal replacement drink products in Germany

(Source: Competitor's Analysis)

The landscape of protein and meal replacement drinks exhibits a distinctive pattern, generally demonstrating less fluctuation in price levels compared to the insect protein market. As presented in Figure 7,

A relatively uniform panorama of pricing in the protein shake segment landscape can be discerned, presenting a rather monotonous facade. Milbona, though, disrupts this uniformity, positioning itself as an anomaly with an ultra-affordable price per 10g of protein at a mere 0.21 €. The industry averages around 0.87 € per 10g of protein, creating a relatively level playing field. Intriguingly, BodyAttack, boasting the most substantial online presence, adopts a surprisingly modest price per 10g of protein at 0.70 €, challenging the norm. Conversely, Unmilk, despite a less commanding online presence and a lower protein content, holds its flag high with a 1.16 € price tag. Their unconventional choice of protein source, specifically pea protein instead of the standard whey, might be the root of this deviation.

Reflecting on Unmilk's below-average online presence, a question emerges: Can their hypothesized value-based pricing strategy succeed in the broad mass market by offering vegan alternatives? Observing the current state of the market, it remains to be seen whether Unmilk's trajectory will ascend toward broader appeal or whether its focus will remain on serving a specialized, vegan demographic. As the market narrative continues to unfold, the answer will reveal itself.

There is yet another kaleidoscope of pricing to encounter in meal replacement drinks. The per 10g protein prices meander between 0.97 € and 2.23 €, a disparity potentially arising from the varying protein sources used. Unlike the protein drink sector, which prefers whey protein, five of the seven companies analyzed in this segment ventured into alternative protein sources. Y-Food, offering both whey and soy protein products and having a dominant online presence, refrains from capitalizing on its popularity by keeping prices low. This strategy seems to hint at a penetration pricing tactic, luring in a broader consumer base with affordability. In stark contrast, ManaDrink, despite a quieter online presence, levies the heftiest charge. This could indicate a premium pricing strategy to cultivate a luxurious brand image and captivate the high-end consumer demographic.

4.2 Consumer Analysis

4.2.1 Review of Secondary Data

A research study explores the potential effects of reducing meat and dairy consumption by 50% in the European Union. It analyzes environmental impacts, such as greenhouse gas emissions and land use, while modeling alternative land-use scenarios, concluding that it would have a positive impact (Westhoek et al., 2014). However, the study's methodology assumes a proportional effect on production, which may not consider market dynamics and trade. It also overlooks socio-economic and policy factors that could impact implementation and outcomes. The study does not specify a time frame for implementing alternative diets, potentially influencing the results.

Another review assessed the environmental impact of various diets: vegan, vegetarian, pescetarian, and omnivorous. The analysis of 366 articles from 2005-2014 suggested plant-based diets yield lower greenhouse gas emissions and land and water use than animal-based diets (Hallström et al., 2015). Vegan diets had the most significant environmental benefit, followed by vegetarian and pescetarian, while omnivorous diets posed the highest impact. The study underlined the potential of shifting towards plant-based diets for sustainable food systems. However, the observational research methodology leads to limitations in managing confounding factors. Therefore, while insightful, the study might not establish definitive evidence of causal relationships among the variables.

Analyzing factors shaping eating behavior is vital to understanding diet adoption motivations. A Slovenian study probed sustainable dietary practices and attitudes, unveiling a majority's lack of sustainable habits. A secondary analysis of a representative national sample (N = 1079) from the 2019 Slovenian Public Opinion survey was used to examine sustainable dietary patterns, attitudes, and education's influence. Findings revealed that most Slovenians adhered to low-sustainability diets with high meat and milk intake. Advanced education correlated with less meat consumption and sustainable attitudes. However, education did not independently influence fish or milk consumption or sustainability attitudes, except for less meat consumption among those in education. Cultural, social, and economic differences between Slovenia and Germany hinder the findings' direct transferability. The study's reliance on secondary data analysis may overlook some relevant aspects of sustainable dietary patterns and attitudes. A similar study using a representative German sample is suggested for a better context-specific understanding of the German market.

One approach to lessen food consumption's environmental impact, examined in this thesis, is insect consumption. Numerous studies focus on the perception and acceptance of insect-based food in Western Europe. A study analyzed Belgian consumers' acceptance of insect-based meat substitutes, involving 159 students aged 18-25 who filled out a questionnaire on their entomophagy knowledge and experiences. Additionally, they participated in a blind insect-based burger-tasting session, rating burgers on appearance, odor, taste, and overall liking (Caparros Megido et al., 2016). The result was clear: previous knowledge and experiences with edible insects positively influenced the acceptance, as did the appearance and taste. Further, the study indicates that men seem less neophobic than women as the burger appearance influenced them less. The study's applicability, however, is mainly limited to Belgian society and may not be directly relevant to German consumers. Methodological restrictions include a non-representative sample, age limitations, possible selection bias, reliance on self-reported data, and limited evaluation scope. More research with more extensive, diverse samples and sturdy designs is essential for a comprehensive understanding and broader applicability of influencing acceptance factors.

The intrigue in insect-based food has surged with growing consumer acceptance. Multiple studies delve into acceptance across different countries, with one investigating critical factors for acceptance in China and Germany (Hartmann et al., 2015). This research examines food neophobia, disgust sensitivity, perceived benefits and risks, environmental and ethical concerns, and taste preferences, offering insights into insect-eating psychology. The methodology included online questionnaires distributed to participants from both countries and semi-structured interviews for a deeper understanding of attitudes. Limitations include limited generalizability due to convenience sampling, cross-sectional design limiting causal inferences, reliance on self-reported measures, and absence of experimental manipulation. Despite limitations, the study provides vital insights into insect eating psychology, yet further studies are needed to broaden the global understanding of factors influencing insect consumption acceptance.

Another paper explores factors contributing to insect-food acceptance, offering insights into marketing strategies to boost this emerging food market (Alhujaili et al., 2023). The study uses a literature review approach to analyze data on insect-food acceptance, focusing on product attributes, promotion, price, and place. Results indicate that consumer acceptance hinges on several factors. Key determinants include product attributes such as taste, appearance, and safety. Further, public campaigns and expert endorsements positively sway consumer

acceptance. In contrast, consumers may negatively perceive insects as food due to the social and cultural norms associated with insect consumption.

The study also found that high prices may not discourage acceptance, as consumers can associate higher prices with quality. It suggests marketing strategies: promoting processed insect food as safe, healthy, and eco-friendly; targeting early adopters like young, well-educated males; creating a positive experience for reluctant consumers through exposure; and nudging strategies to encourage trial. However, given the Western perspective of the analysis, it is vital to remember that significant cultural differences within Western nations hinder the direct application of these findings to the German market. Furthermore, the research broadly addresses insect-based food acceptance, not specifically insect-based protein supplements. Hence, further German-specific research is needed to refine the understanding of insect-based protein supplements.

Lastly, a Psychology & Marketing journal article examines the influence of image and description on risk perception and intention to purchase edible insects. An experiment involving 238 participants measured the effect of manipulated visual and textual information on consumers' attitudes. The main findings indicate that image and description significantly sway risk perception and buying intent; a positive description and an appetizing image decrease perceived risk and boost purchase intentions (Baker et al., 2016). However, the study concentrates on general insect-based foods, not specifically insect-based protein supplements, and is conducted in the United States (US), a different cultural context than Germany.

In conclusion, the literature reviewed as part of the consumer analysis has highlighted several key drivers influencing consumer acceptance of insect-based food, such as taste, appearance, safety, food neophobia, disgust sensitivity, perceived benefits and risks, environmental and ethical concerns, and taste preferences. Moreover, marketing aspects like promotion, price, and place have been identified as significant factors in consumer acceptance. Nonetheless, the existing body of literature primarily targets general insect-based food products, leaving a gap in understanding specific to insect-based protein supplements in the German market. Additionally, cultural, social, and economic disparities between the countries studied thus far, and Germany may further limit the applicability of the findings.

4.2.2 Review of Primary Data

Since the analyzed secondary data did not provide detailed insights into the German market, the primary data was conducted based on a survey. The survey provided valuable insights into the main drivers for consumers liking insect-based protein drinks in the German market.

	Dependent variable:		
	WTP_avg_corrected		
genderMale	-0.231**	sportfrequency3x	0.256*
	(0.095)		(0.142)
age18-24	-0.461*	ateinsectsbeforeNo	0.445***
	(0.263)		(0.144)
age45-54	-0.724***	insectbenefitsNot beneficial	-0.587***
	(0.257)		(0.143)
age55-64	-0.608**	insectbenefitsRather beneficial	0.176*
	(0.269)		(0.105)
age65+	-1.019***	insectnutritionknowledge	0.398***
	(0.306)	Rather high	(0.148)
salary2.000-3.999	0.270**	insectnutritionknowledge	0.576**
	(0.124)	Very high	(0.235)
salaryN/A	0.481***	insectresourceknowledge	0.283*
	(0.142)	Rather low	(0.157)
dietOmnivor	0.228**	motiveweightRather	0.298**
	(0.113)	unimportant	(0.135)
dietVegetarian	0.399**	motiveethicUnimportant	-0.388**
	(0.166)		(0.153)
Constant	1.475***		
	(0.407)		
Observations	319		
R2	0.386		
Adjusted R2	0.254		
Residual Std. Error	0.702 (df = 262)		
F Statistic	2.936*** (df = 56; 262)		
Note:	*p<0.1; **p<0.05; ***p<0.01		

Figure 8: Summary of the regression analysis result

(Source: Survey data)

Fifteen disparate variables were integrated into the regression model, presenting a null hypothesis stating the uniformity of all regression coefficients to zero. In contrast, the alternative hypothesis posits that a minimum of one variable differs. Figure eight intriguingly presents the model's F-statistic at 2.936, significant at the statistical level of 1%, thereby offering potent evidence to repudiate the null hypothesis. This hypothesis implies that at least a singular independent variable within the model exhibits a significant correlation with the dependent variable, the *Average Willingness To Pay*.

The model shows an R-squared of 0.386, suggesting that the selected independent variables account for 38.6% variability in the dependent variable. To amplify the adjusted R-squared through the stepwise addition of independent variables to the model, the upper limit reached

was 0.254, a value that considers the number of predictors in the model and makes necessary adjustments based on this count, penalizing the addition of unnecessary predictors.

Therefore, encompassing all independent variables, the full explication for the dependent variable's variability within the model is 25.4%. Given the specific domain of human behavior where this regression analysis is employed, the outcome can be deemed reasonably favorable, considering the factors potentially influencing the studied outcomes.

In light of the revealed results, several unique insights crystallized. Gender dynamics reveal a marked disparity in economic decision-making. When placed under the magnifying lens of scrutiny and after neutralizing other impacting variables, men demonstrate a tempered willingness to shell out, expressing an economically cautious side. Their willingness to pay shrinks by 0.231 € on average when contrasted with women, an insight with a 5% significance level.

Age and its influence on consumption patterns also merit consideration. With external influences held in check, the wallet strings of individuals within the age bracket of 45-54 tighten significantly, with a reduced propensity to pay by an average of 0.724 €. This trend intensifies for the demographic of 65 years and above, with a further dampened willingness to spend by 1.019 €, both groups with a statistical significance at the 1% level.

Income, as expected, alters the course of this economic narrative. Individuals within the salary range of 2,000-3,999 € exhibit a wide financial stance, as manifested by their willingness to pay an additional 0.270 €, bearing a 5% significance level.

Subtle variations emerge when the lens of analysis shifts to diet. Omnivores and vegetarians, accounting for other variables, display an increased willingness to pay an additional 0.228 € and 0.399 €, respectively, both significant at the 5% level.

The frequency of engagement in sports, mainly three times per week, enhances the economical disposition toward spending, raising the willingness to pay by 0.256 €, significant at the 10% level.

Previous exposure to insect consumption also makes a difference. Individuals yet to sample insects indicate a higher economic threshold, with a heightened willingness to pay by 0.445 €, a significant finding at the 1% level.

As the secondary data analysis suggested, the perception of insects as a viable food source also holds sway. While those who view insects unfavorably are likely to spend 0.587 € less, their

counterparts who see insects as somewhat beneficial display an enhanced economic willingness to spend, with an additional 0.176 €, significant at the 10% level.

Insect nutritional knowledge proves to be a strong influencer too. With a relatively high and very high understanding of insect nutrition, individuals are more willing to spend 0.398€ and 0.576 €, respectively, both significant at the 1% and 5% levels.

Similarly, the understanding of insect resource usage matters. People with a relatively low understanding of insect resource usage are more willing to pay an additional 0.283 €, significant at the 10% level.

The weight and ethics as driving factors behind eating habits also bear significance. For those who view weight as an unimportant motivator for eating habits, an increased willingness to pay by 0.298 € is significant at the 5% level. Likewise, as also observed in secondary analysis, for individuals who disregard ethics as a determinant of their eating habits, the willingness to pay decreases by 0.388 €, significant at the 5% level.

4.3 Business Viability

4.3.1 Pricing based on Van Westendorp Method

The potential success of an insect-based protein drink startup is contingent upon the consumers' willingness to pay. To examine this factor, a regression analysis was used to form a subsample featuring attributes that significantly enhance payment willingness.

This subsample consisted of survey respondents between 25 and 45, classified as omnivores, vegetarians, or vegans, participating in sports three times or more per week, perceiving insect-based food as beneficial, and exhibiting substantial knowledge of the nutritional aspects of insects. Notably, their dietary choices are not primarily influenced by ethical considerations. This group represented 23 of the 319 total survey participants.

The Van Westendorp Price Sensitivity Meter was employed to assess this subsample's price perceptions, covering four categories: too cheap (undermining product quality), cheap (excellent value for money), expensive (yet within the area of potential purchase), and too expensive (beyond purchasing consideration).

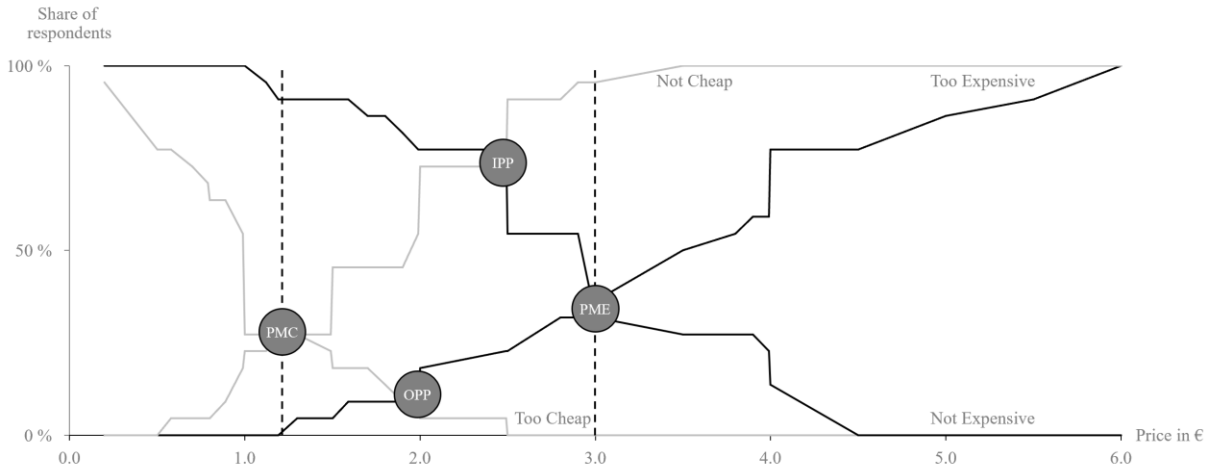

Figure 9: Van Westendorp's Price Sensitivity Meter applied

(Source: Survey data)

As Figure 9 indicates, the resulting purchase range stretched from the marginal cheapness (PME) of 1.19 € to the marginal expensiveness (PME) of 3.00 €. The indifference price point (IPP), or the price that customers neither perceive as cheap nor expensive, was identified as 2.50 €. The optimal price point (OPP), representing a price deemed an excellent value, was pinpointed at 2.00 €.

Contemplating the market penetration strategy, it becomes apparent that the IPP for the novel insect-based protein drink - fixed at 2.50 € per 330ml bottle - provides a unique position. This price point allows for swift market penetration, fostering rapid market share acquisition, albeit in a nascent market.

Despite the market for insect-based protein drinks being uncharted, it is crucial to consider its indirect competition with the well-established protein drink market. Although, as analyzed in the competitor's analysis, this market is mainly populated with whey variants, only one producer offers pea protein as a source, making it an intensely competitive space with as many as 13 identified players.

The nascent insect-based protein drink must employ a differentiation and competitive pricing strategy to navigate this competition successfully. Setting the price point at the IPP, the drink can shape its perceived value, carving a distinct niche that separates it from traditional competitors.

Nevertheless, competition with cost-effective whey protein drinks presents a formidable challenge. The production cost for whey drinks is currently unmatchable, mainly due to the lack of economies of scale in insect protein production due to limited demand.

The competitive market reveals an average price per 10g of protein at 0.87 €. The priciest alternatives are Unmilk's pea protein drink at 1.16 € and Optimum Nutrition's whey protein offering at 1.09 €. Considering these competitors, the insect-based protein drink's price should exceed that of the whey protein, preferably more than 1.09 € per 10g of protein.

All competitors' average protein content is 8.5g per 100g, with Unmilk as the only alternative protein source at 6.1g. The insect-based protein drink should aim for a protein below the market average to optimize costs and prevent substantial pricing disparity with competitors. The proposed protein content in line with Unmilk's, i.e., 6.1g per 100 ml, would result in an overall protein content of 20.13g per 330 ml bottle.

In alignment with the overall strategy for rapid market share acquisition, the price should match the consumer indifference price point of 2.50 €. Consequently, the resulting price per 10g of protein would be 1.17 €, marginally higher than Unmilk's offering. This calculated pricing approach ensures a competitive position in the market.

4.3.2 Market Size

PricewaterhouseCoopers predicts a drastic growth of the global insect food market, growing with a CAGR of 30% between 2022 and 2026, further predicting that conventional meat, being responsible for 90% of global meat supply in 2025, will only account for 40% by 2040 (PwC Italy, 2022). The report further states that the products most likely to replace the lost share of conventional meat are plant-based food with meaty flavor, algae-based food, and insect-based food. This indicates a massive growth of the insect food market within the next 20 years.

To dive deeper into the market potential and evaluate the total addressable market (TAM), critically examining the prospective customer base within the German market is crucial. This work’s regression analysis indicated that Germans between 25-45 doing sports multiple times weekly had the highest willingness to pay. The share of this age group is 24.2%, resulting in a group of 20.1 million Germans (Statista, 2022). Furthermore, across all age groups above 18, 20% of Germans do sports multiple times per week, indicating that four million Germans are between 25-45 and do sports multiple times per week (Statista, 2023). Furthermore, a study regarding the German sport nutrition market in 2017 revealed that approximately 43% of Germans partaking in regular physical exercise reported purchasing sports-specific food and beverages several times a month, and 12% consumed these items weekly (The Information Service of the German Economic Institute, 2018). This further specifies the German sample, of

which 1.72 million are between 25-45, doing sports regularly, and would buy sport-specific nutritional products. Therefore, the so-called heavy users, buying these products multiple times per week, are overall 0.48 million people.

The same study analyzed the German sports nutrition industry and exposed noteworthy financial trends. Retail outlets generated a total of 156m € through the sales of sports nutrition products. Remarkably, protein supplements accounted for nearly three-quarters (73%) of these sales, thereby amassing revenues of 114m €. Interestingly, protein bars and powders represented the bulk of protein supplement sales in 2017, amassing 94.1% of the market. This figure represented a significant growth from the previous year - protein bars expanded by 28.7% and protein powders by 16.6%, signifying a robust growth trajectory for the sector.

However, despite their low market share at 2.1m €, equaling 1.83% of total protein product sales, protein drinks demonstrated an unprecedented growth rate of 45.8%. This swift increase, the most substantial among all protein supplement categories, illustrates the expanding demand for protein drinks within this timeframe.

While the data from 2016 and 2017 is illuminating, it is pivotal to note that these statistics represent only a snapshot of a highly dynamic market. The global projection publicized by the same study in 2016 anticipated that by 2022, the sports nutrition sector would reach an estimated worth of 45b €, marking a 60% expansion since 2016. Developing nations with rising income levels and urbanization were seen as principal drivers of this growth, with their demands for protein outpacing those of more developed markets, such as Germany (Bashi et al., 2019).

However, it is important to contextualize this growth. The surge in protein demand within developing markets predominantly corresponds to consuming traditional dietary staples, namely meat and dairy products. Indeed, meat consumption in these countries has experienced a tripling growth compared to developed nations (Delgado, 2020). Consequently, protein supplements comprise only a tiny fraction of the total protein intake within these burgeoning markets. Furthermore, these supplements are typically considered premium products, so their significant growth is most commonly observed within developed countries. Therefore, applying the aforementioned 60% growth rate to the German protein market still holds validity, indicating an expected market worth of 250m € by 2022.

Considering a consistent share of 73.1% for protein supplements (based on 2017 data), the projected sales for 2022 would amount to approximately 182.5m € in the German retail sector. However, due to a growth stagnation of GDP in 2022, no further growth is assumed for the

calculation (Federal Office of Statistics, 2023). Hence, the total available market (TAM) for protein supplements sold in retail in Germany for 2023 is estimated to be around 182.5m €.

A market report from the US identified that overall, the mean direct distribution of protein products in the US via online shops accounted for 47% of total sales in 2021 (Grand View Research, 2022). Despite their cultural differences, Germany and the US have significant similarities, such as their strong economies, high-income countries, technological leadership, and high education standards, making technology ubiquitous. This makes it possible to apply the online distribution share numbers from the US to the German market. Assuming that the online buying ratio is the same across all products under the roof of protein products, the TAM via online distribution would be 85.8m €, resulting in an overall TAM for retail and online distribution of 268.3m €.

The investigation into the serviceable available market (SAM) necessitates comprehensive data collection about the proportion of the market that the RTD protein drinks sector commands. Following the Grand View Research report, it has been unveiled that the RTD protein sector is not merely burgeoning but is, in fact, the most rapidly expanding sector, witnessing a CAGR of 8.5% spanning a decade from 2020 until 2030. Furthermore, the report forecasts that this sector will constitute 17.6% of all sales within the US protein sector by 2023.

Transposing these findings onto the German market implies that the SAM – encompassing the German market for RTD protein drinks and meal replacement drinks – calculates to approximately 47.2m €. However, considering the immense growth of the edible insect market in Europe, with a CAGR of 27% between 2018 and 2023, it is also likely to assume further growth in Germany. Figure 10 offers a visual depiction of multiple prospective scenarios for market development in the years to come.

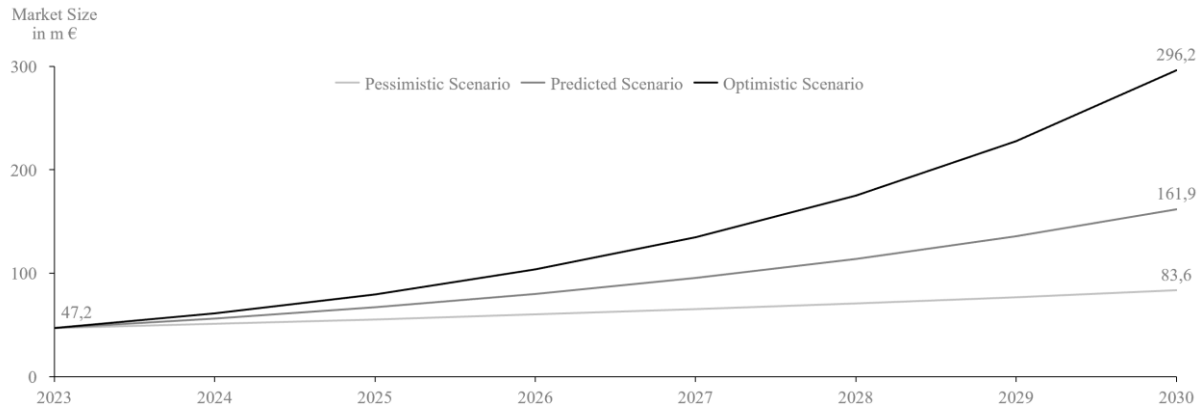

Figure 10: Possible scenarios for German RTD protein market size development

(Source: Adapted from Deloitte, 2023; Adapted from PwC Italy, 2022)

Adopting a conservative viewpoint and assuming a CAGR of 8.5% based on the growth of the US RTD protein sector posits a future overall market size of 83.6m € by 2030. Especially with recent regulatory changes regarding insect-based food in Germany and signals indicating trends toward healthier and more sportive lifestyles, it is likely to assume that the market in Germany will grow faster than in the US (Deloitte, 2023).

An optimistic scenario would assume that the German RTD protein sector grows in the same CAGR as predicted by PwC for the novel food market in Europe, deploying a CAGR of 30%, predicting a more expansive overall market size of 296.2m € (PwC Italy, 2022).

However, the truth mostly lies somewhere between, with a CAGR of 19.3%, which is precisely the middle of the previous two scenarios. With this predicted scenario, the market size would be nearly 162m € by 2030.

Consequently, a profound examination of market trends and future predictions is paramount for accurately assessing the market's development trajectory.

CHAPTER 5: CONCLUSIONS, IMPLICATIONS, AND LIMITATIONS

5.1 Main Findings and Conclusion

The PEST analysis conducted in this study yielded significant findings regarding the German market. From a political perspective, the government's focus on environmental sustainability and efforts to combat climate change create a supportive environment for introducing innovative protein products. Moreover, the sociocultural landscape indicates a growing interest in alternative protein sources and a shifting dietary landscape driven by health and sustainability concerns.

The consumer analysis, which incorporated secondary and primary data, provided valuable insights into consumer preferences and acceptance of insect-based products. The secondary analysis revealed the importance of environmental knowledge in shaping dietary choices, the potential benefits of adopting an insect-based diet, and the role of marketing in promoting acceptance. The primary data complemented the secondary data by providing specific information relevant to the German market. It indicated that individuals between the ages of 25 and 45, with omnivorous or vegetarian diets, who engage in frequent sports activities, consider ethics a critical driver of their diet, perceive eating insects as beneficial and possess high knowledge about insect nutrition and environmentally friendly resource usage, have the highest willingness to pay for insect-based protein drinks.

The competitor’s analysis shed light on the pricing strategies and market dynamics of existing insect protein and protein drink players. The analysis of the insect protein market revealed complexities and differentiations in pricing strategies, indicating indecisiveness across the sector. However, within the RTD protein drink sector, the market players tended to price their products closer together, suggesting a more competitive environment. Interestingly, the analysis also uncovered a market gap in the RTD sector, as no existing players were offering RTD protein drinks with insect protein, thus presenting a unique opportunity to tap into the market.

Considering the competitive nature of the RTD sector, the pricing strategy should aim to differentiate the product by indicating a slight premium compared to whey protein suppliers. However, the price should still be reasonably low to penetrate quickly and gain a significant market share. The identified indifference price point (IPP) of 2.50 € per 330ml bottle aligns with this strategy, enabling rapid market share acquisition while still signaling a premium product.

Turning to business viability, the protein industry presents a substantial opportunity with a total market size of nearly 270m € in 2023. Protein bars and powders dominate the market, accounting for approximately 50m € in the RTD sector. The projected compound annual growth rate (CAGR) of 8.5% until 2030 positions the RTD sector with the highest growth potential within the protein industry in Germany and internationally. The analysis emphasizes the significance of the online business model, which accounts for nearly half of all sales, highlighting its importance for business viability and facilitating international expansion.

In conclusion, the main findings of the analysis underscore the potential for introducing insect-based protein drinks in the German market, highlighting the favorable alignment of political, economic, sociocultural, and technological factors. However, the intense competition in the market poses a significant challenge. Therefore, a comprehensive marketing strategy is essential, emphasizing the environmentally friendly production of insect-based protein and its nutritional richness and directly targeting a young, sporty, health-conscious, and environmentally conscious consumer segment that prefers online purchases.

By carefully considering these factors and implementing an effective marketing strategy, the business venture stands a strong chance of success.

5.2 Managerial / Academic Implications

The findings of this study have substantial implications for businesses considering entry into the insect-based protein drinks market in Germany. First, the study's identification of a niche consumer segment willing to pay for such products provides businesses with a transparent target market to focus on. Individuals aged 25-45 engage in frequent sports activities and have ethical and environmental concerns about their dietary choices.

The importance of the online business model highlighted in this study also provides an essential direction for businesses in terms of distribution strategy. Nearly half of all protein product sales are online, implying that businesses must have a robust online presence and effective e-commerce strategies to succeed in this market.

Lastly, the study underscores the importance of a well-designed marketing and pricing strategy. Given the RTD protein drink competition, businesses must carefully price their products and communicate the benefits of insect-based proteins to the target market.

This study further contributes to the academic literature by comprehensively analyzing Germany's emerging insect-based protein drinks market. It expands understanding of consumer preferences and willingness to pay for alternative protein sources. The study also identifies a vital market gap in the RTD protein drinks sector, providing a foundation for further academic research.

The study's exploration of the relationship between environmental knowledge and dietary choices further adds to the literature on consumer behavior. In addition, the study's findings about the importance of the online business model in the protein products sector provide valuable insights for researchers interested in the digitalization of the food and beverages industry.

Finally, this research could be the starting point for comparative studies across different markets to understand how regional differences affect consumer attitudes toward insect-based protein drinks.

5.3 Limitations and Further Research

Even though this investigation was executed meticulously, it harbors several elements of limitations, which have the potential to shape the interpretations and deductions made from its outcomes.

To commence with, the initial consideration lies in the analysis surrounding the market size. This dimension did not incorporate potential revenue streams generated from the companies' physical stores, which may contribute significantly to the financial success of protein drink and meal replacement drink manufacturers. Consequently, this could exponentially augment the overall market size. However, a lack of accessible data leads to a decidedly cautious strategy. Furthermore, as online sales were included in the evaluation, the absence of information regarding brick-and-mortar stores potentially contributes to underestimating the latent market potential and profitability.

The second constraining factor lies in the small subsample of 23 observations used for the Van Westendorp Method model, affecting price generalizability and introducing uncertainty. In addition, the method's inherent subjectivity may misrepresent actual market behavior, a phenomenon known as hypothetical bias. Moreover, it does not account for competitive market dynamics that could significantly influence consumer buying behavior. Thus, despite providing

valuable insights into perceived value, the Van Westendorp Method should be used cautiously due to its limitations.

In addition to these outlined constraints, the primary data of the investigation, derived solely from a singular survey, may not fully encapsulate the intricate weave of consumer attitudes and behavioral trends toward insect-based protein drinks. As such, this method may introduce a certain level of bias, heavily dependent on respondents' self-reported data, which may sway several variables, including social desirability or recall bias and the attitude-behavior gap. Moreover, a critical examination of the survey's descriptive statistics, particularly when juxtaposed with representative data from German society, reveals that the survey sample does not accurately reflect the demographic composition of German society.

The underpinning limitations that this study illuminates pave the way for future research, which could tackle these areas of uncertainty and thereby bolster the understanding of this rapidly evolving domain. A more extensive and representative German sample used for a regression analysis could substantiate the conclusions drawn from this study and offer more nuanced insights into the labyrinth of consumer behavior and pricing.

Research endeavors venturing forward could also examine the potential of insect-based protein drinks across diverse markets, assessing the international generalizability of these findings and thereby laying a cornerstone for potential international market expansion.

As an extension of the current research, it would be fruitful for future inquiries to incorporate a series of surveys or merge qualitative research methods like interviews or focus groups. These methods could provide a more encompassing and nuanced view of consumer perceptions and attitudes. Additionally, scholars could endeavor to incorporate data from physical stores owned by German RTD manufacturers to present a more balanced and comprehensive understanding of the market size and prospective profitability of insect-based protein drinks.

Lastly, subsequent research could explore the impact of marketing strategies on consumer acceptance and purchase intentions for insect-based protein drinks via an experimental design. This could involve manipulating distinct product features across exclusive groups with varied stimuli, such as health benefits, environmental footprint, or sensory pleasure. The aim would be to discern which messages, content, or features influence demand-related variables the most, like purchase intention, among different consumer segments.

REFERENCE LIST

Alhujaili, A., Nocella, G., & Macready, A. (2023). Insects as Food: Consumers' Acceptance and Marketing. In *Foods* (Vol. 12, Issue 4). MDPI. https://doi.org/10.3390/foods12040886

Andonov, A. D. (2020). The Application of Search Engine Optimization in Internet Marketing. *2020 55th International Scientific Conference on Information, Communication and Energy Systems and Technologies, ICEST 2020 - Proceedings*, 37–41. https://doi.org/10.1109/ICEST49890.2020.9232740

Baker, M. A., Shin, J. T., & Kim, Y. W. (2016). An Exploration and Investigation of Edible Insect Consumption: The Impacts of Image and Description on Risk Perceptions and Purchase Intent. *Psychology and Marketing*, *33*(2), 94–112. https://doi.org/10.1002/mar.20847

Bashi, Z., Ramirez, M., McCullough, R., & Ong, L. (2019, August 16). *Alternative proteins: The race for market share is on*. McKinsey Report on Agriculture. https://www.mckinsey.com/industries/agriculture/our-insights/alternative-proteins-the-race-for-market-share-is-on, last accessed: 30.05.2023

Caparros Megido, R., Gierts, C., Blecker, C., Brostaux, Y., Haubruge, É., Alabi, T., & Francis, F. (2016). Consumer acceptance of insect-based alternative meat products in Western countries. *Food Quality and Preference*, *52*, 237–243. https://doi.org/10.1016/j.foodqual.2016.05.004

Capobianco, N., Basile, V., Loia, F., & Vona, R. (2021). Toward a sustainable decommissioning of offshore platforms in the oil and gas industry: A pestle analysis. *Sustainability (Switzerland)*, *13*(11). https://doi.org/10.3390/su13116266

Christodoulou, A., & Cullinane, K. (2019). Identifying the main opportunities and challenges from the implementation of a port energy management system: A SWOT/PESTLE analysis. *Sustainability (Switzerland)*, *11*(21). https://doi.org/10.3390/su11216046

Delgado, C. L. (2020). Rising Consumption of Meat and Milk in Developing Countries Has Created a New Food Revolution. *International Food Policy Research Institute*. https://academic.oup.com/jn/article-abstract/133/11/3907S/4818041, last accessed: 30.05.2023

Deloitte. (2023). *German Fitness Market recovers after Pandemic*. The German Fitness Market 2023. https://www2.deloitte.com/de/de/pages/consumer-business/articles/deutscher-fitnessmarkt-studie.html?id=de:2em:3cc:4dcom_share:5awa:6dcom:consumer_business, last accessed: 30.05.2023

Din, A. U., Han, H., Ariza-Montes, A., Vega-Muñoz, A., Raposo, A., & Mohapatra, S. (2022). The Impact of COVID-19 on the Food Supply Chain and the Role of E-Commerce for Food Purchasing. *Sustainability*, *14*(5). https://doi.org/10.3390/su14053074

Duanmu, J. L., Bu, M., & Pittman, R. (2018). Does market competition dampen environmental performance? Evidence from China. *Strategic Management Journal*, *39*(11), 3006–3030. https://doi.org/10.1002/smj.2948

European Central Bank. (2023). *Thai baht (THB)*. Eurosystem. https://www.ecb.europa.eu/stats/policy_and_exchange_rates/euro_reference_exchange_rates/html/eurofxref-graph-thb.en.html, last accessed: 30.05.2023

European Commission. (2023, January). *Approval of fourth insect as a Novel Food*. Food Safety. https://food.ec.europa.eu/safety/novel-food/authorisations/approval-insect-novel-food_en, last accessed: 30.05.2023

Federal Office of Statistics. (2023a, February 24). *Press release No. 070*. Press Releases. https://www.destatis.de/DE/Presse/Pressemitteilungen/2023/02/PD23_070_811.html, last accessed: 30.05.2023

Federal Office of Statistics. (2023b, April 27). *Press release No. 166*. Press Releases. https://www.destatis.de/EN/Press/2023/04/PE23_166_62321.html, last accessed: 30.05.2023

German Bundestag. (2023). *Applications on insects as an ingredient in food submitted*. Nutrition. https://www.bundestag.de/dokumente/textarchiv/2023/kw11-de-insekten-936470#, last accessed: 30.05.2023

Grand View Research. (2022). *Protein Supplements Market Size, Share & Trends Analysis Report*. Nutraceuticals & Functional Foods. https://www.grandviewresearch.com/industry-analysis/protein-supplements-market#, last accessed: 30.05.2023

Grossi, G., Goglio, P., Vitali, A., & Williams, A. G. (2019). Livestock and climate change: Impact of livestock on climate and mitigation strategies. *Animal Frontiers*, *9*(1), 69–76. https://doi.org/10.1093/af/vfy034

Hallström, E., Carlsson-Kanyama, A., & Börjesson, P. (2015). Environmental impact of dietary change: A systematic review. In *Journal of Cleaner Production* (Vol. 91, pp. 1–11). Elsevier Ltd. https://doi.org/10.1016/j.jclepro.2014.12.008

Harberger, A. C. (1950). Currency depreciation, income, and the balance of trade. *Journal of Political Economy*, *58*(1), 47–60. https://www.jstor.org/stable/1826198, last accessed: 30.05.2023

Harrigan, K. R. (1985). An Application of Clustering for Strategic Group Analysis. In *Strategic Management Journal* (Vol. 6). https://doi.org/10.1002/smj.4250060105

Hartmann, C., Shi, J., Giusto, A., & Siegrist, M. (2015). The psychology of eating insects: A cross-cultural comparison between Germany and China. *Food Quality and Preference*, *44*, 148–156. https://doi.org/10.1016/j.foodqual.2015.04.013

Henderson, B. (1970). *The Product Portfolio*. Boston Consulting Group. https://www.bcg.com/publications/1970/strategy-the-product-portfolio, last accessed: 30.05.2023

Iacovidou, E., Busch, J., Hahladakis, J. N., Baxter, H., Ng, K. S., & Herbert, B. M. J. (2017). A parameter selection framework for sustainability assessment. *Sustainability (Switzerland)*, *9*(9). https://doi.org/10.3390/su9091497

Kaplan, R. S., & Norton, D. P. (2008). Mastering the Management System. *Harvard Business Review*. hbr.org/2008/01/mastering-the-management-system, last accessed: 30.05.2023

Kauppi, S. M., Pettersen, I. N., & Boks, C. (2019). Consumer acceptance of edible insects and design interventions as adoption strategy. *International Journal of Food Design*, *4*(1), 39–62. https://doi.org/10.1386/ijfd.4.1.39_1

Lie-Piang, A., Braconi, N., Boom, R. M., & van der Padt, A. (2021). Less refined ingredients have lower environmental impact – A life cycle assessment of protein-rich ingredients from oil- and starch-bearing crops. *Journal of Cleaner Production*, *292*. https://doi.org/10.1016/j.jclepro.2021.126046

Lusk, J. L., & McCluskey, J. (2018). Understanding the impacts of food consumer choice and food policy outcomes. *Applied Economic Perspectives and Policy*, *40*(1), 5–21. https://doi.org/10.1093/aepp/ppx054

Lynch, H., Johnston, C., & Wharton, C. (2018). Plant-based diets: Considerations for environmental impact, protein quality, and exercise performance. In *Nutrients* (Vol. 10, Issue 12). MDPI AG. https://doi.org/10.3390/nu10121841

Madau, F. A., Arru, B., Furesi, R., & Pulina, P. (2020). Insect farming for feed and food production from a circular business model perspective. In *Sustainability (Switzerland)* (Vol. 12, Issue 13). MDPI. https://doi.org/10.3390/su12135418

Massa, L., Tucci, C., & Afuah, A. (2016). A critical assessment of business model research. *Academy of Management Annals*, *11*(1).

Monterrosa, E. C., Frongillo, E. A., Drewnowski, A., de Pee, S., & Vandevijvere, S. (2020). Sociocultural Influences on Food Choices and Implications for Sustainable Healthy Diets. *Food and Nutrition Bulletin*, *41*(2_suppl), 59S-73S. https://doi.org/10.1177/0379572120975874

Müller, H. (2005). Statische und dynamische Messungen des Preisempfindens: Ergebnisse einer empirischen Studie im deutschen Zigarettenmarkt. *Marketing: Zeitschrift Für Forschung Und Praxis*, *27*(3), 185–196. http://www.jstor.org/stable/41918884, last accessed: 30.05.2023

Oraman, Y. (2014). An Analytic Study of Organic Food Industry as Part of Healthy Eating Habit in Turkey: Market Growth, Challenges and Prospects. *Procedia - Social and Behavioral Sciences*, *150*, 1030–1039. https://doi.org/10.1016/j.sbspro.2014.09.115

Otero, D. M., da Rocha Lemos Mendes, G., da Silva Lucas, A. J., Christ-Ribeiro, A., & Ribeiro, C. D. F. (2022). Exploring alternative protein sources: Evidence from patents and articles focusing on food markets. *Food Chemistry*, *394*, 133486. https://doi.org/https://doi.org/10.1016/j.foodchem.2022.133486

Porter, M. (1980). *Competitive Strategy: Techniques for Analyzing Industries and Competitors*. Free Press. https://id.lib.harvard.edu/alma/990008573060203941/catalog

PwC Italy. (2022). *The Novel Food Market: Key Trends & Considerations*. https://www.pwc.com/it/it/publications/assets/docs/pwc-the-novel-food-market.pdf, last accessed: 30.05.2023

Schmidt, C. W. (2008). The Yuck Factor When Disgust Meets Discovery. *Environmental Health Perspectives*, *116*(12), A524–A527. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2599783/, last accessed: 30.05.2023

Springmann, M., Clark, M., Mason-D'Croz, D., Wiebe, K., Bodirsky, B. L., Lassaletta, L., de Vries, W., Vermeulen, S. J., Herrero, M., Carlson, K. M., Jonell, M., Troell, M., DeClerck, F., Gordon, L. J., Zurayk, R., Scarborough, P., Rayner, M., Loken, B., Fanzo, J., … Willett, W. (2018). Options for keeping the food system within environmental limits. *Nature*, *562*(7728), 519–525. https://doi.org/10.1038/s41586-018-0594-0

Statista. (2022). *Age Distribution of the German Society*. https://de.statista.com/statistik/daten/studie/1351/umfrage/altersstruktur-der-bevoelkerung-deutschlands/, last accessed: 30.05.2023

Statista. (2023, February). *Sport Frequency of the German Population between 2017 and 2021*. https://de.statista.com/statistik/daten/studie/171911/umfrage/haeufigkeit-sport-treiben-in-der-freizeit/, last accessed: 30.05.2023

Stonig, J., Schmid, T., & Müller-Stewens, G. (2022). From product system to ecosystem: How firms adapt to provide an integrated value proposition. *Strategic Management Journal*, *43*(9), 1927–1957. https://doi.org/10.1002/smj.3390

The Information Service of the German Economic Institute. (2018). *Power in the Protein Market*. Industry and Sectors. https://www.iwd.de/artikel/power-im-proteinmarkt-396663/, last accessed: 30.05.2023

Turck, D., Bohn, T., Castenmiller, J., De Henauw, S., Hirsch-Ernst, K. I., Maciuk, A., Mangelsdorf, I., McArdle, H. J., Naska, A., Pelaez, C., Pentieva, K., Siani, A., Thies, F., Tsabouri, S., Vinceti, M., Cubadda, F., Frenzel, T., Heinonen, M., Marchelli, R., … Knutsen, H. K. (2022). Safety of partially defatted house cricket (Acheta domesticus) powder as a novel food pursuant to Regulation (EU) 2015/2283. *EFSA Journal*, *20*(5). https://doi.org/10.2903/j.efsa.2022.7258

United Nations. (2019). *World Population Prospects 2019*. https://www.ined.fr/fichier/s_rubrique/29369/wpp2019.highlights_embargoed.version_07june2019.fr.pdf, last accessed: 30.05.2023

van Huis, A., & Gasco, L. (2023). Insects as feed for livestock production. *Science*, *379*(6628), 138–139. https://doi.org/10.1126/science.adc9165

Westhoek, H., Lesschen, J. P., Rood, T., Wagner, S., De Marco, A., Murphy-Bokern, D., Leip, A., van Grinsven, H., Sutton, M. A., & Oenema, O. (2014). Food choices, health and environment: Effects of cutting Europe's meat and dairy intake. *Global Environmental Change*, *26*(1), 196–205. https://doi.org/10.1016/j.gloenvcha.2014.02.004

World Overshoot Day 2022. (2022). World Day. https://www.genevaenvironmentnetwork.org/events/earth-overshoot-day-2022/, last accessed: 30.05.2023

APPENDICES

Survey Script

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ReCaptcha, Please confirm that you are not a robot.

Page Break

01. Is your regular place of residence in Germany?

- ○ Yes
- ○ No

Display This Question:

If Is your regular place of residence in Germany? = No

Thank you for taking the time to participate in this survey.

As this survey is specifically aimed at analyzing the German market, responses from participants who are not regular residents of Germany can, unfortunately, not be considered. Thank you for your understanding.

Skip To: End of Survey If Thank you for taking the time to participate in this survey… Is Displayed

End of Block: Start

Start of Block: Intro

Dear participant,

thank you for taking the time to participate in my survey, which I am creating as part of my master's thesis. This survey aims to learn more about your preferences and willingness to pay regarding novel protein drinks. I would like to emphasize that your answers will be kept confidential and only used for statistical purposes. Your data will not be shared with third parties.

Thanks again for your participation, and enjoy the survey!

- ○ I will read the questions carefully and answer them to the best of my knowledge.

End of Block: Intro

Start of Block: Sport

02. How regularly per week are you active in sports? (on average)

- ○ Not at all
- ○ 1 time
- ○ 2 times
- ○ 3 times
- ○ 4 times or more

Display This Question:

If How regularly per week are you active in sports? (on average) != Not at all

03. How intense is your training? (on average)

- ○ Very light training (e.g., light stretching, walking)
- ○ Light exercise (e.g., yoga, stretching, Pilates, light swimming)
- ○ Moderate training (e.g., Nordic walking, Zumba, aerobics, jogging, cycling)
- ○ Heavy training (e.g., intense interval training, heavy strength exercises, sprints or hill runs, spinning, high-intensity swimming)
- ○ Very heavy training (high-performance sport)

End of Block: Sports

Start of Block: Nutrition

04. How would you most likely describe your eating habits?

- ○ Omnivorous (consisting of meat, fish, vegetables, fruit, etc.)
- ○ Flexitarian (focus on plant-based diet, only occasional consumption of animal products)
- ○ Pescatarian (consumption of vegetable products and fish and seafood)
- ○ Vegetarian (consumption of plant products as well as selected animal products such as milk, cheese and eggs)
- ○ Vegan (consumption of exclusively plant-based products)

---

05. How do you take your protein? (multiple selection possible)

- ☐ Meat and fish
- ☐ Dairy products
- ☐ Eggs
- ☐ Legumes
- ☐ Nuts
- ☐ Whole grain products
- ☐ Protein-rich vegetables (e.g., broccoli or spinach)

---

06. Nutrition What are the motives of your chosen diet for you?

Health and well-being	☆ ☆ ☆ ☆ ☆
Environment and sustainability	☆ ☆ ☆ ☆ ☆
Animal welfare and ethical concerns	☆ ☆ ☆ ☆ ☆
Weight management / muscle building	☆ ☆ ☆ ☆ ☆
Culture and religion	☆ ☆ ☆ ☆ ☆

---

07. I am generally interested in new and unconventional types of foods and beverages.

- ○ I do not agree at all
- ○ Disagree for the most part
- ○ Neither / no opinion
- ○ Agree; for the most part
- ○ Fully agree

---

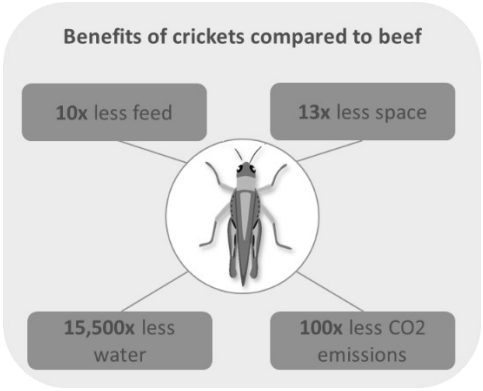
08. I always eat very healthy.

- ○ I do not agree at all
- ○ Disagree for the most part
- ○ Neither / no opinion
- ○ Agree; for the most part
- ○ Fully agree

End of Block: Nutrition

Start of Block: Willingness to Pay

09. Significantly more resources are used to produce 1kg of protein from beef than to produce 1kg of protein from insects.



I was already fully aware of this information beforehand:

- ○ I do not agree at all
- ○ Disagree for the most part
- ○ Neutral / No opinion
- ○ Agree; for the most part
- ○ Fully agree

---

10. Insects are rich in proteins, healthy fats, and fiber. So even compared to fish and meat, they are a real power food, as you can see from the chart below.

	SALMON, FARMED	WHOLE EGGS	CRICKETS	MEALWORMS	BEEF (90% LEAN)	TOFU
PROTEIN	20.4g	19.2g	59,9g	55,1g	22.4g	24.6g
FAT	13.4g	15.2g	24,5g	31,9g	11.2g	12.6g
SATURATED FAT	3g	4.8g	7,9g	9,0g	4.4g	2.7g
OMEGA-3 FATTY ACIDS	2.5g	0.1g	2,8g	2,5g	0.04g	0.5g
FIBER	0g	0g	14,4	11,0g	0g	2.7g

I was already fully aware of this information beforehand:

- ○ I do not agree at all
- ○ Disagree for the most part
- ○ Neutral / No opinion
- ○ Agree; for the most part
- ○ Fully agree

---

11. I believe that eating insect-based protein is beneficial to my health.

- ○ I do not agree at all
- ○ Disagree for the most part
- ○ Neither / no opinion
- ○ Agree; for the most part
- ○ Fully agree

---

12. I have consumed insects before.

- ○ Yes
- ○ No
- ○ I can not remember

---

13. Please select "Strongly disagree" to confirm that you are answering the questions carefully.

- ○ I do not agree at all
- ○ Disagree for the most part
- ○ Neither / no opinion
- ○ Agree; for the most part
- ○ Fully agree

---

14. To gain more confidence in an insect-based product, high-quality and healthy-looking product packaging is essential.

- ○ I do not agree at all
- ○ Disagree for the most part
- ○ Neither / no opinion
- ○ Agree; for the most part
- ○ Fully agree

---

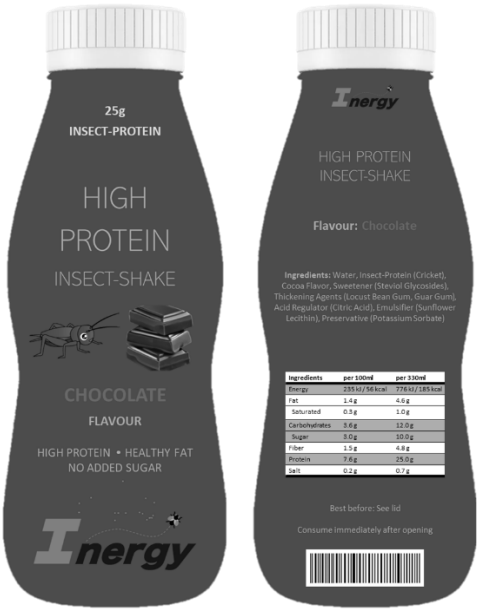
15. When I think about consuming insects in processed form (for example, in powder form as part of a chocolate-flavored protein shake), I feel primary:

- ○ Enthusiasm or excitement
- ○ Curiosity or interest
- ○ Sense of responsibility
- ○ Disgust or discomfort
- ○ Anxiety or fear

Page Break

16. Here you can see a few protein drinks that are sold in German supermarkets in the refrigerated section. In most cases, the majority of the protein they contain is whey protein (milk).

17. Here you can see an example of how an alternative protein drink with 333ml could look in the future, whose protein is derived entirely from insects.



18. What price do you feel is cheap for the product? (Indication in X,XX€)

_____

19. What price do you feel is expensive but just acceptable for the product? (Indication in X,XX€)

_____

20. What price do you feel is too expensive for the product? (Indication in X,XX€)

_____

21. What price do you feel is too cheap for the product so that you would doubt the quality? (Indication in X,XX€)

_____

End of Block: Willingness to Pay

Start of Block: Demography

22. What is your gender?

- ○ Woman
- ○ Man
- ○ Divers

---

23. How old are you?

- ○ Under 18
- ○ 18-24
- ○ 25-34
- ○ 35-44
- ○ 45-54
- ○ 55-64
- ○ Over 65

---

24. In which area do you live?

- ○ Rural (<10,000)
- ○ Small town (10,000-50,000)
- ○ City (50,000-100,000)
- ○ Large city (>100,000)

---

25. What is your highest educational degree already completed?

- ○ No school diploma
- ○ Lower secondary school diploma
- ○ Secondary school diploma
- ○ Highschool diploma
- ○ Bachelor
- ○ Master
- ○ Promotion

26. To which occupational group do you belong?

- ○ Pupils
- ○ Student
- ○ Employed
- ○ Self-employed
- ○ Unemployed
- ○ Pensioner

27. What is your household's net monthly income?

- ○ Less than 2.000€
- ○ 2.000-3.999€
- ○ 4.000-5.999€
- ○ 6.000-7.999€
- ○ 8.000-9.999€
- ○ More than 10.000€
- ○ I do not want to disclose this information

28. What is your relationship status?

- ○ Single
- ○ Married
- ○ Divorced
- ○ Widowed

End of Block: Demography

Start of Block: End

29. Thank you very much for taking the time to participate in this survey.

_____

End of Block: End

At this stage, it is important to note that this survey was translated, as it was originally shared in German.