

BARLEY AS A RAW MATERIAL FOR BEER PRODUCTION AND ITS PROCESSING TECHNOLOGY

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Abstract

The study aimed to assess consumer awareness of beer production and its importance in their daily lives. It explored consumption habits, frequency, and locations of beer consumption. Being a less affluent country, the cost of beer posed challenges, affecting sales. The study also examined whether the offered price fulfilled the specified conditions for beer production. It summarized data on consumer interest, consumption habits, and beer-related factors. The Covid-19 pandemic impacted the economy, including the beer industry, emphasizing the need for hygiene in equipment, production processes, and employee practices. The conflict in Ukraine caused price hikes, including beer. Despite this, citizens were already accustomed to ongoing price increases. The pandemic highlighted the importance of controlling, emphasizing, and extensively testing food products, including beer. The study supported these findings, presenting data on gender, age, nationality, and consumer preferences related to beer. Although multiple countries were included, the main focus was on Kosovo, which had the highest representation. The findings showed that 73.9% of respondents enjoy beer consumption, with 26.7% willing to spend an average of 30 to 40 euros. Furthermore, 89.9% of participants were willing to pay a higher, symbolic amount for higher-quality and safer beer meeting necessary standards for adequate consumption.

Keywords: Consumers, technological process, sales system functioning, breweries, production, analysis, cost.

Introduction

Barley is a fundamental raw material in beer production, renowned for its unique properties that significantly influence the final product's flavor, aroma, and overall quality. As one of the oldest cultivated grains, barley has been used in brewing for thousands of years, with evidence of its use dating back to ancient civilizations (Hord et al., 2008). Its high enzymatic activity, particularly diastatic enzymes, allows for effective starch conversion during the mashing process, making it an ideal choice for brewers (Bamforth, 2009).

The processing of barley involves several critical steps, including malting, mashing, and fermentation, each playing a pivotal role in transforming raw barley into the essential ingredient for diverse beer styles. The malting process activates enzymes that convert the starches in barley into fermentable sugars, which are crucial for yeast fermentation (Stewart et al., 2017). Understanding the complexities of barley processing technology not only highlights its importance in brewing but also sheds light on how variations in barley quality and processing techniques can impact the sensory attributes of beer.

This introduction aims to provide an overview of the role of barley in beer production, emphasizing its significance as a raw material and the technologies employed in its processing. The following section details the materials and methods employed in a comprehensive study on beer consumption conducted between January and July 2022. This research aimed to gather insights from a diverse population across several countries, including Kosovo, Belgium, Albania, and the United States. Emphasizing ethical considerations, the study ensured participant anonymity and adhered to data protection policies throughout the process. The

methodology included a carefully designed questionnaire, distributed electronically via social media and various communication platforms, enabling broad participation from individuals aged 17 to over 56. The results offer valuable insights into consumer behaviors, preferences, and perceptions related to beer consumption, forming the foundation for subsequent analyses and discussions.

1. Materials and work methods

1.1 Work Material: This study was conducted during the period from January to July 2022. The study is anonymous and follows the privacy preservation rules regarding reliability and data protection policy. The questionnaire was addressed to the population of Kosovo and several other countries, specifically targeting individuals aged 17 to 56+ years.

Participants voluntarily participated in this research without any coercion or undue pressure. The research was conducted in the state of Kosovo, Belgium, Albania, and the United States. For data collection and statistical analysis of the collected data and questionnaire, I utilized social networks and pre-processing software programs. The questionnaire was created using Google Forms and distributed through various social networks such as Facebook, Whatsapp, Email, and other electronic methods.

1. The questionnaire consists of precisely 17 questions, and all participants were allowed to participate regardless of gender, age, or profession. The completion of the questionnaire was voluntary.
2. The questionnaire did not require any personal/private information such as name, phone number, or address. Instead, basic fundamental information was requested, such as age, gender, and place of residence. The answers were also easy to understand, with options such as yes/no or multiple-choice. The questionnaire comprised 17 questions, where the initial questions focused on information about beer consumption, frequency of consumption, design, and alcohol percentage. The last 5 questions were about the reasons for consumption, laboratory testing, and price increases. Participants had the opportunity to answer all the questions.

1.2 Work Method: Throughout the process, I have made efforts to include almost the entire state of Kosovo and reach as many participants as possible. The questionnaire was distributed through phones, tablets, and laptops to maximize the number of participants. The questionnaire was created using Google Forms and distributed through various phone applications such as Viber, Whatsapp, Email, as well as social media platforms like Instagram and Twitter.

1.3 Data Processing Method: After collecting 701 virtual interviews through the questionnaire over a period of approximately two months, I started analyzing and processing them one by one. The questionnaire was created using options in Google Forms and Excel and was distributed through various social networks. The data processing will be demonstrated through the creation of tables, which will provide detailed information on the number of participants, their participation in all questions, and the results of the response quantity. In addition to tables, graphs and figures have been created to visually display the significant differences and various opinions of the participants.

2. Results and discussions

2.1 Study on beer consumption: This study aimed to gather as much information as possible regarding beer consumption, design, type, place of production, alcohol percentage, analysis, laboratory testing, and price increase to ensure high-quality and safe beer. However, we have

managed to obtain some important answers that provide a comprehensive understanding of this research.

Out of a total of 701 participants, we were able to achieve a balanced interpretation of opinions regarding gender, where approximately 51.9% of the participants were female and 48.1% were male. Although the questionnaire was conducted virtually, online, we have expanded sufficiently to reach some places outside of Kosovo, but it is understood that the majority of participants were from Kosovo. The questionnaire was completed by a total of 701 individuals. Regarding gender, we have analyzed the participation of females and males through the percentage, as shown in the following table:

Table 1. Participation of Respondents

		Gender			
		Frequency	Percentage	Valid percentage	Cumulative percentage
Valid	Male	265	48.1	48.1	48.1
	Female	286	51.9	51.9	100.0
	Total	551	100.0	100.0	

In the above-mentioned table, we have recorded the number of participants and analyzed the participation of males and females in the survey. During the distribution of the questionnaire, we attempted to distribute it equally among males and females. As a result, the questionnaire was completed by 286 females, precisely 51.9%, and by 265 males, precisely 48.1%. In the above table, "The number of participants " represents the number of participants for each gender, "(%)" shows the participation converted into percentages, and "Cumulative percentage " should be equal to 100.0 to demonstrate the accuracy of the calculation.

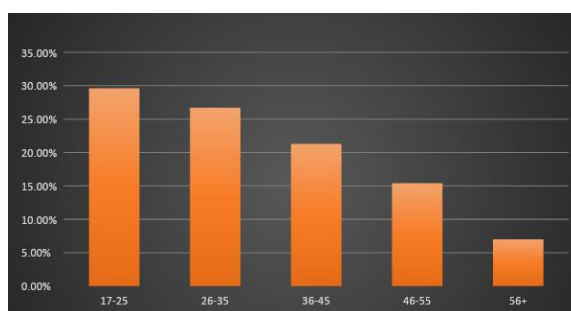


Figure 1. Calculation of Participating Ages

In graph number 1, the age of the participants is presented and divided into percentages. The figure shows that the survey was primarily completed by younger age groups, starting from 17 years old and then experiencing a significant increase around the age of 25. There is a slight decrease in the age group of 26-35, and a gradual decline in participation for the age group of 56+. The age group that participated the most in the survey is the 17-25 age group, precisely 29.6%. Furthermore, the calculation was also made regarding the participants' place of residence. Although it was challenging to gather data from different locations, we made efforts to include as many participants as possible. The following table, number 3, provides a clear explanation of the participation from different countries.

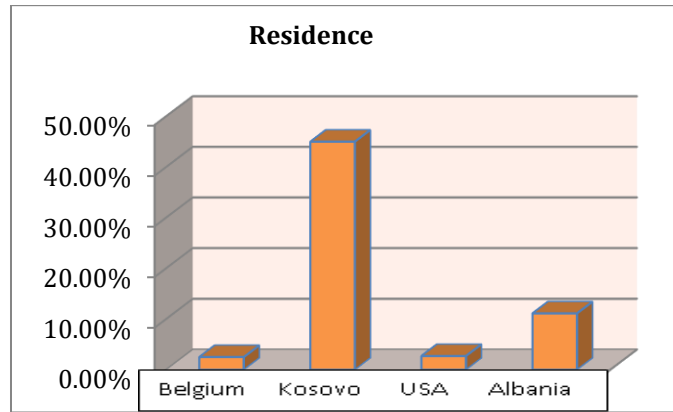


Figure 2. Calculation of the Percentage of Participants based on Residences.

In graph number 2, the different locations where the surveys were completed are presented. It is evident that there was a higher percentage of surveys completed in the state of Kosovo, precisely 45%. Then, Albania with 11.1%, the USA with 2.7%, and Belgium with 2.5% had lower participation rates.

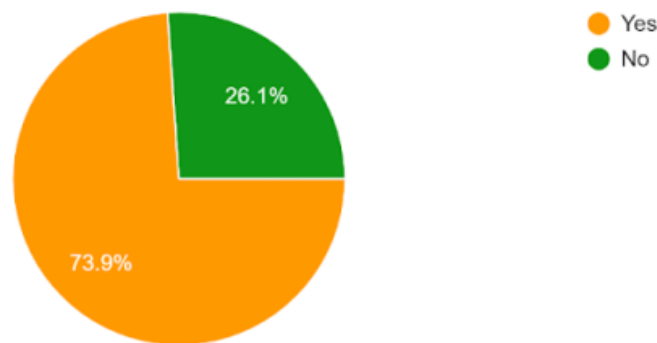


Figure 3. Consumer Satisfaction with Beer Consumption.

Graph number 3 presents the question of whether you enjoy consuming beer, and based on the survey, a large number of responses were recorded. Two options, YES/NO, were used, and for the first option, it was filled to a significant extent (73.9%), meaning that this percentage responded with YES, indicating that they enjoy beer consumption. On the other hand, (26.15%) indicated that they do not prefer beer consumption. Based on this, we can see that the majority enjoys beer consumption, with a small percentage expressing the opposite.

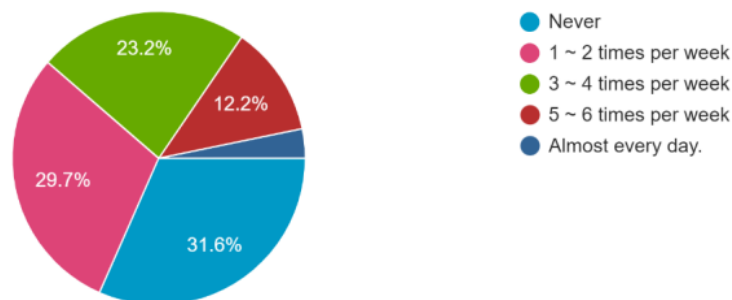


Figure 4. Frequency of Beer Consumption.

Continuing with another figure, specifically Graph number 4, it represents the question of how often you consume beer. It shows that responses were filled as follows: (23.2%) never consume beer, (31.6%) consume it 1-2 times per week, (29.7%) consume it 3-4 times per week, (12.2%) consume it 5-6 times per week, and a very small portion almost every day.

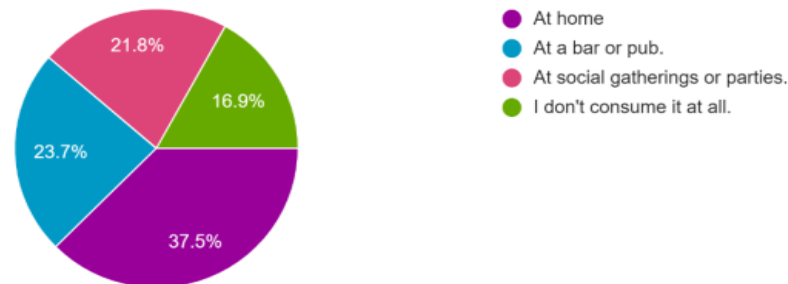


Figure 5. Beer Consumption Venue Selection.

In Graph number 5, the respondents' answers regarding the question of where they usually consume beer are presented in percentages. The purple color, which occupies the largest portion of the figure with (37.5%), indicates that they usually consume beer at home. The blue color, representing (23.7%), indicates that they consume beer at a bar or pub. The green color, representing (16.9%), indicates that they do not consume beer at all.

In Graph number 6, the respondents' answers regarding the question of whether they consider design an important factor when buying beer are presented in percentages. The orange color, which occupies the largest portion of the figure with (67.3%), indicates that for the consumers, design is very important. The green color, representing (32.5%), indicates that for this portion of consumers, design is not important at all.

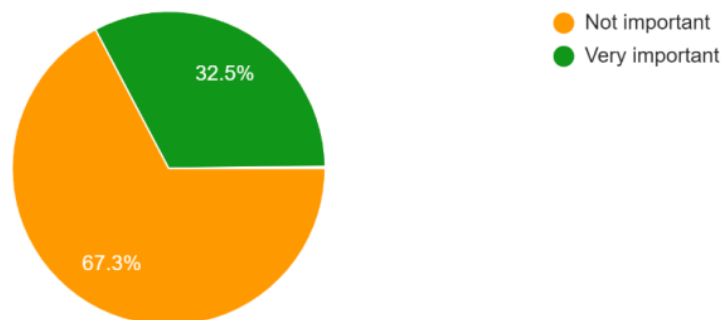


Figure 6. Importance of Beer Design.

In Graph number 7, the respondents' answers regarding their preferred type of beer are presented in percentages. The white color represents (31.4%) who prefer light-colored beer, the red color represents (31.4%) who prefer amber beer, the black color represents (31.4%) who prefer dark beer, and the none represents (17.5%) who do not like beer at all.

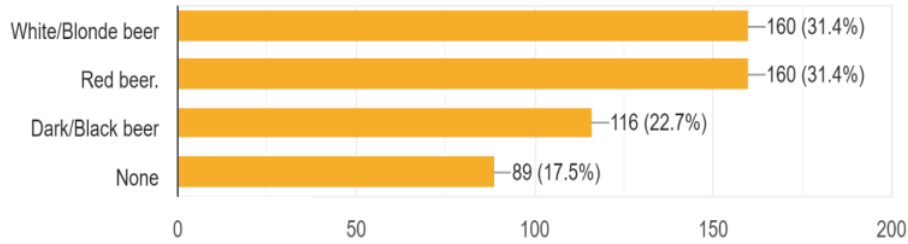


Figure 7. Types of Beers

In Graph number 8, the respondents' answers regarding their perception of price as an important factor when buying beer are presented in percentages. The green color represents (48.5%) who consider price to be unimportant or nearly unimportant, the purple color represents (34.1%) who consider it very important, and the blue color represents (17.2%) who consider it to be moderately important.

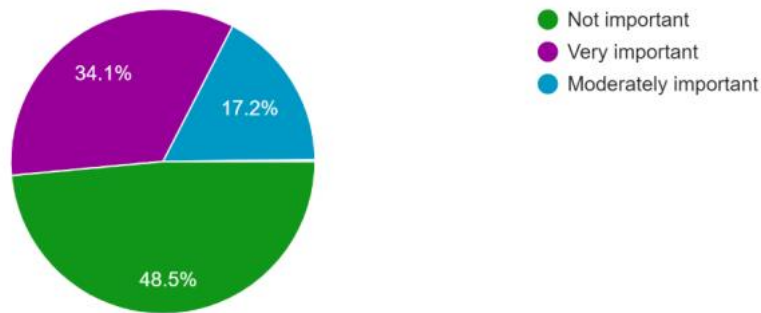


Figure 8. Beer Price

Graph 9 illustrates the responses of the survey participants regarding the question of whether the country of origin is important when purchasing beer. The orange color, which represents the majority of the figure with (66.1%), indicates that the country of origin is highly significant for consumers. Conversely, the light green color, with a percentage of (33.7%), suggests that for this portion of consumers, the country of origin is almost irrelevant.

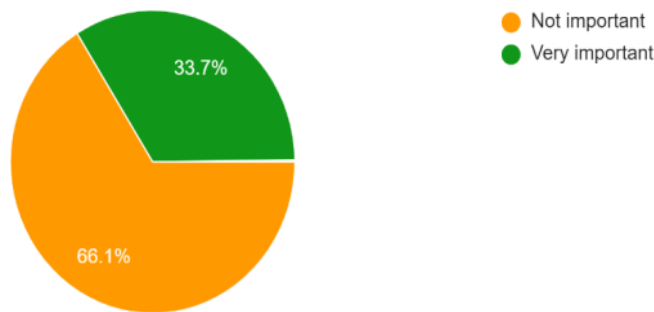


Figure 9. The beer's country of origin

In the above graph, we can see that out of to many respondents, precisely (74.7%) have expressed that the alcohol content is an important factor, while the overwhelming majority (25.3%) have expressed or believe that it is not important the alcohol content.

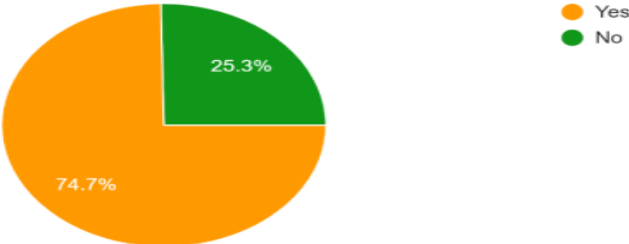


Figure 10.The alcohol content in beer.

In the above graph, we can see the responses of the participants regarding their monthly spending on beverages. In the percentage of (26.7%), it was expressed that they spend approximately less than 10 euros , followed by (14.3%) who stated that they spend more than 40 euros , (18.9%) spend up to 10-20 euros, (17.5%) spend 20-30 euros, (15.1%) spend 30-40 euros while (7.5%)do not spend at all because they do not consume beverages.

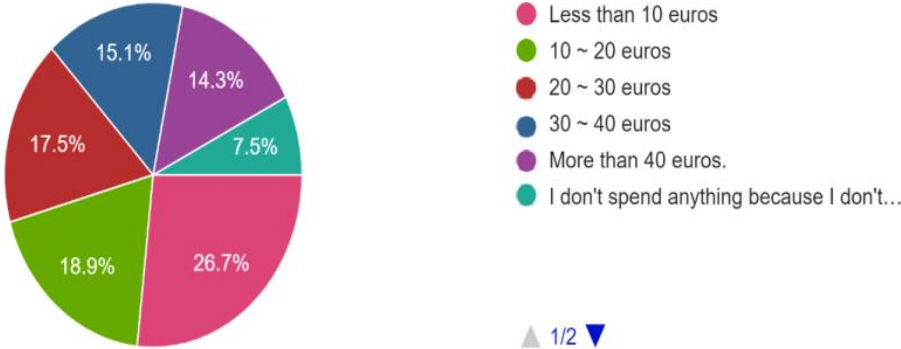


Figure 11. Monthly Spending on Beverages

Regarding the question you have asked, we can observe that the percentages are very close to each other, indicating little variation in beer purchases over the last 3 months based on the respondents. Approximately (26.8%) of the respondents have purchased beer for themselves, represented by the blue color in the graph. (24.3%) have purchased beer for their partner, indicated by the pink color. The red color represents (20.5%) who have purchased beer for a colleague, and (7.8%) have not purchased beer for themselves, their partner, family members, or any colleagues, indicating the time when they are off work. Lastly, (20.7%) have purchased beer for family members.

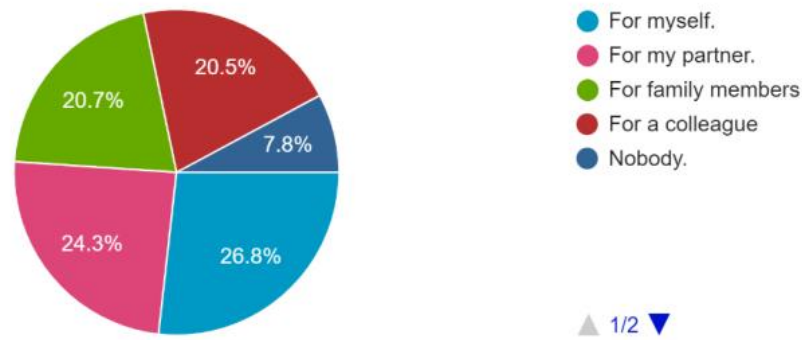


Figure 12. Beer Purchases for the Last 3 Months

According to this graph, the responses of the surveyed citizens regarding the main reasons for consuming beer are shown. The figure indicates a significant increase in the number of citizens who stated that they consume beer solely for entertainment, with a total of 226 votes or precisely (42.6%). Then, a portion of (32.8%) responded that they consume it solely to escape a problem, as we know that beer has a relaxing effect and its effectiveness varies depending on the dosage or quantity used. Furthermore, the overwhelming majority of 164 votes or more precisely (30.9%) utilize it to manage stress, which can be a source of various personal life issues. A considerable percentage of (30%) expressed that they consume it for social purposes, often encountered during evening gatherings, and (18.1%) consume it as part of a ritual, including various festivities that are part of our daily lives.

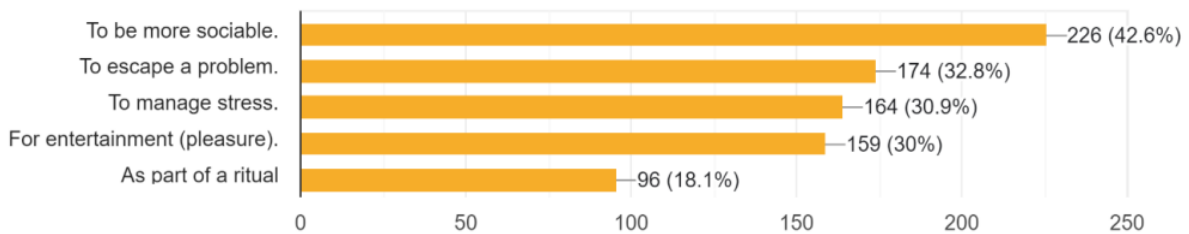


Figure 13. Main reasons for consuming beer

This graph simplifies the three key factors that influence people's decision to purchase beer. The majority, specifically (34.2%), consider the type of beer as the most important factor. This is reasonable because there is a wide variety of beer available, but not all of them undergo thorough testing and analysis, especially in Kosovo. Additionally, the appearance, including the name and logo, holds importance for (33.6%) of respondents, which is justified as we are inevitably influenced by design in the modern era. With 138 votes and precisely (27%), the decision to purchase beer is influenced by considering the country of origin, as some countries have a tradition of beer production and sales, making them unique and distinct from others. The vessel type, whether it's a bottle or can, affects the purchasing decision for (26.2%) of respondents, as it varies depending on the place of consumption, be it a walk or elsewhere. Regarding alcohol content, only (19.5%) expressed that it influences their purchase, as the majority prefer higher alcohol percentages. A smaller number of individuals, 76 in total or (14.8%), consider price as a factor, but it is not a significant percentage since consumers

understand that higher quality products in the market require a higher investment. On the other hand, (21.5%) have stated that they do not purchase beer at all because they do not consume it.

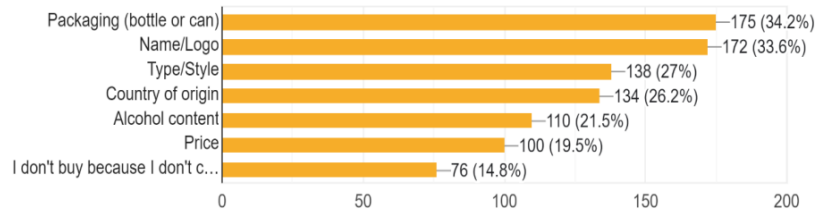


Figure 14. Key Factors for Beer Purchasing

In Graph 15, we observe the distribution of responses from the survey participants regarding the question of whether they believe that all necessary analysis and testing are conducted for each type of beer. A number of (57.5%) have expressed that they believe it does have an impact, (15%) have stated that it does not, indicating a very small percentage, and (27.5%) have expressed that it has very little impact. Based on this, we can easily say that more than half believe that all these tests are conducted, even though it is impossible for them to always be precise in terms of laboratory testing. However, it is always necessary to strive and approach the impossible, and this is achieved with the help of consumers regarding costs, the economic development of the country, and many other factors.

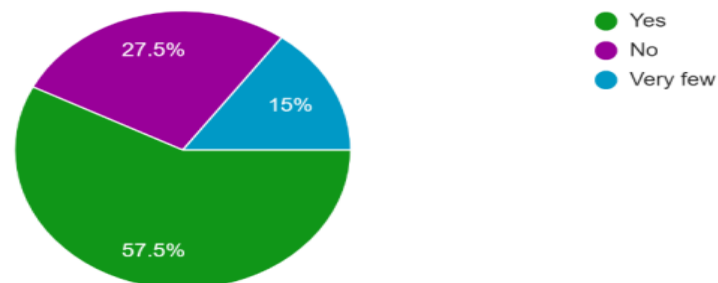


Figure 15. Beer Analysis and Testing

Out of a total of respondents, (89.9%) have expressed their agreement, in other words, they are willing to pay more to have a higher quality and safer beer, while (10.1%) have expressed their disagreement. Therefore, we can say that almost everyone is willing to take a step forward in order to provide a product that meets all the specified norms and standards.

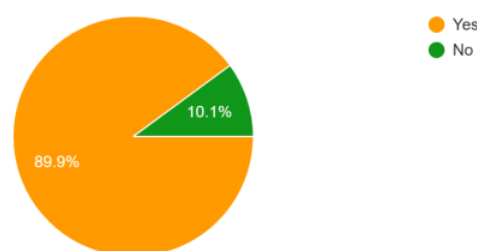


Figure 16. Increase in the price of craft beer

3. Conclusions

In this study, we had a participation rate of 48.1% males and 51.9% females, aiming for a heterogeneous sample to obtain desired responses. The age group that participated the most was between 17-45 years, accounting for 77.6%. Kosovo stood out with a participation rate of 45%. Overall, citizens showed a general preference for beer consumption, with 31.6% stating they consume it at least 1-2 times per week. A small percentage of 23.2% do not consume beer at all, which can be due to individual principles or religious reasons.

Among beer consumers, a majority of 37.5% stated they mostly consume beer in bars, while the rest is consumed in both bars and homes. The aesthetic aspect of beer, which consumers distinguish alongside quality and safety, was also highlighted in the survey. 67.3% expressed its significance as a key factor in beer purchasing.

Citizens showed an equal preference of 31.4% for white, red, and dark beer. Regarding the price of beer, 48.5% declared it as an important factor, along with the country of origin, which holds a longstanding tradition for many. 66.1% expressed support for this view.

Furthermore, the study analyzed the monthly expenditure on all drinks, with 26.7% or 136 citizens spending between 20-30€. This amount is considered solid and sufficient for our country, although it may be low compared to standards in other countries. On the other hand, 7.5% stated they spend over 40€ per month. Another finding was that 140 citizens had purchased beer for themselves in the last three months, accounting for 26.8%, while 24.3% purchased beer for their partners and 20.5% for relatives.

Regarding the reasons for consuming beer, 42.6% stated they consume it solely for entertainment or pleasure, while others have various reasons such as stress management, socializing, or being part of a ritual.

As for the necessary analyses and testing, 57.5% believe they are necessary, and simultaneously, 89.9% expressed their willingness to pay more for a quality and safe beer.

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