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Restaurant Waste Management;
Perception of Restaurant Managers on the New Practices and Challenges
in Dubrovnik

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ABSTRACT

Food waste is a recurring global issue, as it raises social, economic and financial concerns. Each year, approximately 1.3 billion of food is wasted along the supply chain, on a global level.

Despite the significance of these problems, there was limited concern in the academic literature.

By having introduced a new waste management program in Dubrovnik, this paper focuses on data collected from 30 restaurant managers/owners, with the goals to explore and comprehend their perception of the new practices and challenges when it comes to proper food waste disposal in Dubrovnik restaurants.

The results showed that there was a significant dissatisfaction in the attitudes and negative perception by the restaurant managers/owners of the new waste program in Dubrovnik.

Key words: Restaurant, Food, Waste, Management, Environment, Dubrovnik.

INTRODUCTION

SCOPE, SOURCES, TYPES

Food waste is an important environmental issue, especially in the hospitality industry where the amount of food waste has grown significantly. On a global level, approximately 1, 3 billion tons of food is wasted each year along the supply chain which is raising social, economic and environmental concerns. The concerns include climate change, pollution of water and air, loss in biodiversity, overharvesting, etc. (FAO, 2013a). The supply chain is the process from food production to food consumption. (Principato, L., Pratesi, C. A., & Secondi, L. (2018).

According to the data from the (Canadian Chain Industry Review, 2013) restaurant food waste is inevitable. In the USA in 2008, it was recorded that approximately 86 billion pounds of food was wasted, of that 19% was created by the food and retail services. Canadian Chain Restaurant Industry Review (2013), At EU level, around 42% of food is lost at consumption, which means that the consumers are directly responsible for wasting a lot of edible food, which results to 89 million tons of wasted food on a yearly basis. (Principato, L., Pratesi, C. A., & Secondi, L. (2018). In restaurants, food waste has two levels: food wasted during preparation, and food wasted during consumption. In UK restaurants, about 45% of waste is generated in the preparation phase in the kitchen, 21% of waste occurs from food deterioration, in other words spoilage and expiration, and 34% of waste is uneaten food left by clients on the plate. (Wrap, 2013b).

Food wasted during preparation falls under: overproduction, overstocking, cutting, peeling and overcooking the food. Food waste is differentiated between avoidable and unavoidable waste. Unavoidable food waste consists of meat and fish bones, vegetable peels, etc. This kind of food

waste is difficult to reduce, but it doesn't mean that it should be disposed properly. Also, certain types of unavoidable food can be given to animals, such as fish heads and meat bones.

Avoidable food waste is the waste that depends on the clients' preferences, such as: bread crust, potato skins, apples, orange pulp, etc.

Following the management of food waste, it is evident that it occurs in all parts of the supply chain. Food waste occurs from producing, consuming to disposing the food. The food may end up lying in a field, damaged while transported, expired in the supermarket, lost somewhere in the fridge, to being left on the plate. (Kummu,M., de Moel, H., Porkka,M., Siebert,S., Varis, Ward, P.J. (2012)

ENVIRONMENTAL, ETHICAL AND HEALTH CONCERNS

Food waste also causes health problems, it was noted that in Australia for every ton of wasted food that is sent to the landfill, food releases around 750kg of carbon dioxide. (Sustainable Restaurant Association, 2010). To grow and ship the food that may never be consumed takes too much energy to produce for it to end up in a landfill.

It was stated that food waste along the supply chain, negatively impacts the freshwater and land. With these resources additionally billion of people could be fed, if the land and crop losses were halved. (Christ, K. L., & Burritt, R. 2017). In 2011, according to (Vittuari, 2016) a loss of 20% of the energy was wasted on food output, which could have contributed to reducing the use and dependency on fossil fuels.

The USA produces enough food to sustain approximately 860 million hungry people, which is twice the amount which is needed to feed the whole US. (Menas, Adenso-Diaz & Yurt, 2011).

It is estimated that by 2030, the food demand will increase significantly, which results in more waste being created. (Bloom, 2010).

The consequences of further food waste could be devastating, as the USA alone produces more food than necessary, and spends even more money on a yearly basis to dispose the waste. (Gunders, 2010).

FINANCIAL CONCERNS

From a financial standpoint, food waste causes a significant financial loss in restaurant business. On a global level, approximately 1000 billion dollars is wasted on food per year, and rises to 2600 billion, when considering the hidden environmental hidden costs such as: water, oil, land. (FAO,2013). According to (Bowling D., 2015) the UK the cost of food on a yearly basis accounts to more than £2.5 billion, it was suggested that if in two years the food costs could be reduced by £250 million if only UK restaurants reduced their waste by only 5%.

OBSTACLES TO PROPER WASTE MANAGEMENT

Yin (1994) found that restaurant employees in the US were untrained for the proper disposal of food waste. It was noted that most employees do not use the FIFO (First in- First out) method properly. Sometimes the employees are not even aware of the poor conditions the groceries come in, and do not bother checking their orders. Another issue was the poor communication between the sectors in the kitchen, to prepare a steak with a salad; sometimes the salad is made too early, which ends up withered and soiled. (Yin,1994).

In 2016, a more recent study was conducted, and it was mostly focused on the restaurants located in the region of Tuscany and Lazio. Principato, L., Pratesi, C. A., & Secondi, L. (2018). This research included 127 restaurants located near tourist sites and coastal areas. The questionnaire

was divided into five sections, and the participation was voluntary. The first phase focused on the level of awareness of the restaurant manager on how critical the issue of food waste is and its main impacts. In the second phase, the restaurant managers needed to list the main causes of food waste in their restaurants and in a percentage evaluate how much food waste is generated both in the kitchen and leftovers on the clients' plates. In the third phase, the restaurant managers were asked to specify which strategies they have implemented to reduce the food waste in their restaurants. In the fourth phase, the restaurant managers were asked how they tend to implement certain strategies, if they have not already. In the final fifth phase, the conductors gathered basic information on the location of the restaurants and the average price of a meal per person.

Principato, L., Pratesi, C. A., & Secondi, L. (2018).

The results of the second phase in this survey showed that approximately 12.93% of food waste was during the preparation in the kitchen and spoiled or incorrectly prepared food. Leftover food by clients was found to be equal to 15.83%. On the other hand, 13 out of 127 restaurants claimed that they had no food thrown away during the preparation phase, and 16 out of 127 restaurants declared that around 30% of food was wasted in the kitchen, and approximately 40% of food was leftover on the clients' plates. Principato, L., Pratesi, C. A., & Secondi, L. (2018).

From the research, 14% of restaurants in Berkeley admitted to disposing inedible food to landfills, even though the city has strict policies for composting. (Stop Waste, 2016) They explained that they did not have time to properly dispose of the food waste, nor the resources to change their behavior. (Stop Waste, 2016)

SOLUTIONS

Properly disposing food waste, composting, donating, reselling and re-using the scraps can result in reducing the food waste in landfills, therefore reducing the CO₂ emissions being produced into the atmosphere.

By implementing a system that could reduce the amount of food waste being produced, such as a “weight-based system”, which means that the waste is weighed, and the restaurant is charged based on how much waste they produce. This could motivate restaurants to produce less waste, which could result in easier management of the food disposal.

RESTAURANT WASTE MANAGEMENT IN HISTORIC URBAN TOURIST AREAS

Dubrovnik is very rich in history and its cultural and natural heritage. During the Dubrovnik Republic in 1296, they were the first ones to build medieval sewer systems, when major cities in Europe knew little about this kind of waste disposal. Today, Dubrovnik is under the Natura 2000 protection. Natura 2000 is an ecological network composed of areas of importance for the conservation of endangered species and habitat types of the European Union. Its goal is to preserve or re-establish the favorable status of more than a thousand endangered and rare species and about 230 natural and semi-natural habitat types.

Tourism in Dubrovnik is marked with an expressed seasonality, with high peaks from June to September. The socio-economic impact on Dubrovnik is extraordinary, but the environment is suffering. From April 1st, 2019 Dubrovnik will be operating under the new regime of restaurant waste management. All restaurants in Dubrovnik will be mandatory to recycle. According to one of the restaurant owners in Dubrovnik, Mrs. Walker, and their restaurant did not receive any

information about the new program, as they were told that they could find everything online.

Dubrovnik has suffered a few incidents, such as when one of the employees of a fish restaurant Bota Sare, had been dumping all their waste every night including raw fish, into the general waste behind the Cathedral. Another example is after every season, the cooking oil from restaurants clogs the Dubrovnik sewer system.

In terms of recycling, the waste would be categorized into: general waste, glass, plastic, metal, paper and bio waste. The waste that restaurants previously had was the general waste, which under these new rules should be reduced. The restaurants would be given free containers for all the categories, besides the general waste. In the long run , this program will end up costing more for the managers/owner as they will have to pay the a fixed amount of waste on a monthly basis, regardless of how much waste they produced. Another cost is the general waste which they also pay on a monthly basis, but only how much waste they produced. During the season, it will be difficult to maintain this new program, as the waste will have to be brought to Pile gate every morning from 6a.m.-8a.m. Therefore, the restaurant managers might not be on board with the new program as it will end up costing them more, and include more work when it comes to recycling.

METHOD

PARTICIPANTS AND DATA COLLECTION

The goal of this study was to find out the perception and knowledge of restaurant managers on restaurant waste management, their attitude on waste management practices in their restaurants and the new waste program happening from April 1st, 2019 in Dubrovnik.

The research subjects of this project were restaurant managers/owners in Dubrovnik. The questionnaire was distributed in a paper-based form to 30 restaurant managers/owners. The questionnaires were distributed and collected by the author in person. The target samples were both female and male participants who owned/managed restaurants from all parts of Dubrovnik: Old Town (core), Pile/Ploce area, Lapad/Gruz, Babin Kuk.

The participants received the necessary introduction and instructions on how to fill out the questionnaire. The questionnaire remained anonymous as the participants were required not to reveal their names or the names of their restaurants in the questionnaire.

The questionnaire used for this research was created by Principato, L., Pratesi, C. A., Secondi, L. (2018). They created the survey in order to find out more about the food waste management in restaurants in Italy. This questionnaire was adapted and distributed for the Dubrovnik scene.

Therefore, the questionnaire for this research was recycled by an already scientifically tested and established questionnaire. The questionnaire was mostly based on Likert scale questions (1-5), other questions consisted of open ended questions, such as some suggestions on improving the waste management practices, also writing percentages on how much waste the managers/owners consider their restaurant is generating either from the kitchen or the consumers. The questions

were grouped, by the knowledge of food waste in general, measuring food waste and its “causes” in the managers’ restaurants, actions or intentions by the managers when it comes to reducing food waste, how they manage the food surplus, and finally information on the restaurant.

RESULTS

The study population included 30 restaurant managers/owners who were asked to answer questions on their perception and knowledge on restaurant waste practices both in their restaurant and the new practices starting from April 1st, 2019 in Dubrovnik.

The questionnaire was based on themes. The first set of questions followed the theme on general knowledge and concern on waste management in the world. 90% of the participants had a somewhat agreement on waste management being a serious problem in the food service industry, and that it has negative impacts on the environment.

The second set of questions was themed on where the waste is actually generated from, in the restaurant owners/ managers’ restaurants. There was a slight disagreement when it comes to the waste being generated from the kitchen, about 37% of the managers/owners do not consider that the majority of their waste is generated during the preparation phase in the kitchen. However, a larger part of the group, about 63% of the managers/owners consider that the most waste comes from over purchasing, and large portion sizes.

The third question was one of the open ended questions where managers/owners were asked to identify the food surplus (waste) in their restaurant. About 33% of managers/owners consider that their waste is generated from the kitchen, and 67% of managers/owners believe that the waste

is caused by clients. Contradiction between these two answers indicates that managers are confused or unaware.

In the fifth set of questions, the participants were asked if they have taken any actions on reducing waste, 95% of the participant had a somewhat agreement on taking some actions on reducing waste. These actions include: having better management of daily bookings, offering guests to bring home leftovers, educating employees on ways of reducing waste.

On the other hand, when it came to the question whether to introduce some dishes made with scraps (for ex. fruit and vegetable peelings, fish scraps, etc.), only 37% the managers/owners answered that they would reuse the scraps, and 67% would not reuse the scraps in order to reduce waste.

In the eight set of questions, a follow up set of questions on whether the managers/owners had taken some actions of waste reduction, consisted of types of strategies which have been implemented in their restaurants. Managers seem to have a negative attitude when it comes to selling food on secondary markets at a lower price, as about 63% answered no and 37% of managers answered that they do resell their food surpluses. About 30% of managers/owners are actually donating the food or recycling, reusing the products in some way, and 60% do not seem to see that donating can be an important factor when it comes to waste reduction. Another unpopular way of reducing waste is the sale of food scraps to animal manufacturers, as the vast majority of almost 90% of managers do not implement this, and only 10% of managers answered that they do implement this kind of waste reduction action. Overall, in this set of questions there was a noticeable contradiction when the managers stated that they are implementing some kind

of action plan to reduce food waste, with these results on various types of possible actions which a vast majority of managers admitted were not using.

Some of the comments in the open-ended questions suggested that in order to reduce food waste, plate portions should be downsized, and the prices should go up, the menu should be reorganized in a way that enables the customers to order exactly what they want, to have the ability to personalize their order. This is becoming very important in the service industry; it is all about the personalized experience. Another suggestion was to implement a weight-based system which measures exactly how much waste the restaurant is producing, and would be charged by the amount of waste produced, rather than a fixed amount each month.

The questions from 10-13 are about compliance when it comes to local rules and regulations, and how well informed the managers are by the local authorities. The vast majority 87% of managers answered that they are satisfied with how their restaurant manages food waste, and 13% slightly disagreed or were neutral. When it came to being aware of local regulations and the rules being presented clearly, about 67% of managers answered that they were slightly unaware or neutral, and only 33% would agree that they easily follow local rules and regulations and that there are no misunderstandings when it comes to local authorities informing the restaurants on the new practices.

Questions 14-15 are about the financial concerns of the managers/owners. The vast majority 70% answered that by doing more to reduce food waste would ultimately end up costing their business more, and only 30% believe it won't end up costing them more. When it came to the question whether by doing more to reduce waste by the implementation of the new waste disposal program it would end up saving their business money, the majority of participants 73% somewhat disagreed, and only 33% slightly agreed that doing more to reduce waste would end

up saving their business money.

The last sets of questions were focused solely on the knowledge of the managers/owner of the previous and new program being implemented this year in Dubrovnik. The vast majority (83%) of managers/owners have little to no information about the new waste management programs that they are supposed to be following this year, which are also mandatory for all restaurants. Only 17% of managers/owners have actually been somewhat informed of the new regulations happening from this year, and those restaurants were coming from the core of the Old Town.

DISCUSSION

Reducing food waste would have a positive impact not only on the environment, but would also reduce some financial costs. It seems that managers/owners of restaurant in Dubrovnik are reluctant to change to the new waste management program as they believe that by going along with the program it would end up costing their business even more in the long run. By talking to Mrs. Walker, one of the restaurant owners in Dubrovnik, the results from the questionnaire matched her concerns, when it came to implementing new changes into their restaurant business. The research showed that 90% of participants showed an awareness of the general waste management issues, that it is a serious problem and that it is raising social, economic and financial problems.

There seems to be some confusion among the managers regarding the source of their own waste, some self-satisfaction with the status quo, and also some eagerness to blame both clients and the city. In addition, some resistance to implementing further changes due to perceived financial costs. The results prove that, the restaurant managers/owners as the customers of Cistoca, and other organizations were not included in the decision making process when it came to new programs being introduced. Dubrovnik is pretty late on innovative waste management programs, with this new program the restaurant managers/owners would only be more reluctant to recycle, as it would end up costing their business more.

The research showed that restaurant managers are either confused or unaware of where exactly the waste is being generated from. The results are contradictory, as it seems from the results that when asked about where most of the waste is generated, 63% of managers believe the waste comes from over purchasing and large portions, and when asked to identify a percentage of where their food surplus comes from, 67% of managers believe that the clients are to blame for

the majority of the food waste.

When looking at these results it seems that the managers were either confused or were trying to defend themselves, and blame it all on the customers.

There seems to be a serious issue when it comes to social desirability bias, as the restaurant managers/owners in Dubrovnik are acknowledging the problems on food waste, but are praising themselves and blaming the customers and the city of Dubrovnik on the limitations of waste management practices.

There are also certain limitations when it comes to proper waste disposal, specifically for Dubrovnik which is a dense and historic city, in great need of preservation. Regarding all that, the managers/owners should be even more motivated to preserve the beautiful city of Dubrovnik, by abiding the local rules and regulations when it comes to recycling and managing their food waste disposal. For some people, having to dispose of the waste very early in the morning, and for some very far away from the pickup point, might not be a motivation to properly dispose of the waste. In addition, the employees are an important factor in proper waste disposal, as they need to be educated enough, properly trained, and there shouldn't be a lack of communication amongst all the employees of a restaurant.

In order for the managers/owners to succeed and for Dubrovnik to remain one of the most beautiful cities and part of the UNESCO's Heritage, the city authorities need to do a better job in organizing and making new programs on waste disposal. As some of the most surprising results from the research were that the restaurant managers/owners were little informed on the new program that was implemented, and just by that mistake from the authorities, the motivation from the managers/owners is even lower when it comes to proper waste disposal. The authorities firstly need to research their market, and consult with their customers, in order to maximize the level of

satisfaction and motivation from their customers, the restaurant managers and owners.

APPENDIX A

Questionnaire adapted from Principato, L., Pratesi, C. A., Secondi, L. (2018).

FOOD WASTE IN THE RESTAURANT INDUSTRY

This questionnaire asks about your opinions and experiences regarding food waste in your restaurant. By food waste, we mean any food or ingredients that either are thrown away at any time during the food preparation process, from the kitchen or after the guest has eaten.

1. For each of the following statements, please mark your level of agreement.

	<i>Strongly disagree</i> (1)	<i>Somewhat disagree</i> (2)	<i>Neither agree nor disagree</i> (3)	<i>Somewhat agree</i> (4)	<i>Strongly agree</i> (5)
I think that food waste is a serious problem in the restaurant industry	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I think that food waste causes problems for the natural environment and energy resources	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I think that food waste is a moral and ethical issue	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I think that food waste has a negative financial impact on my business	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

2. CAUSES OF FOOD WASTE

In my restaurant, food waste happens because...	<i>Strongly disagree</i> (1)	<i>Somewhat disagree</i> (2)	<i>Neither agree nor disagree</i> (3)	<i>Somewhat agree</i> (4)	<i>Strongly agree</i> (5)
Portion sizes are too big. Customers leave food on the plate.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Over purchasing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Fresh products are not consumed within the expiry date	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Mistakes made by clients when	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

ordering their meals					
Mistakes made by chefs during the preparation phase	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other causes (please specify_____)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

3. In your restaurant, about how much (in percentage terms) how much of the food is wasted in the kitchen and how much is caused by customers?

Food surplus (waste) in my restaurant

Waste happens in kitchen%

(preparation phase)

Waste caused by clients%

ACTIONS AND INTENTIONS

4. My restaurant has taken some specific actions to reduce food waste

<i>Strongly disagree</i> (1)	<i>Somewhat disagree</i> (2)	<i>Neither agree nor disagree</i> (3)	<i>Somewhat agree</i> (4)	<i>Strongly agree</i> (5)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

5. If you have taken action to reduce waste, please specify what type of strategies were used

	YES	NO
Better management of daily bookings and therefore more efficient purchase planning	<input type="checkbox"/>	<input type="checkbox"/>
Offering special boxes/bags for customers to take home leftovers	<input type="checkbox"/>	<input type="checkbox"/>
Freezing food scraps within 2 hours to be consumed within the following 24 hours.	<input type="checkbox"/>	<input type="checkbox"/>
Educating kitchen staff about ways to reduce food waste	<input type="checkbox"/>	<input type="checkbox"/>
Other specific strategies: (please describe) _____		

6. Would it be advisable to introduce some dishes made with kitchen scraps (for example fruit and vegetable peelings, fish scraps, etc...?)

1) Definitely YES 2) More YES than NO 3) More NO than YES 4) Definitely NO

7. Do you think that implementing initiatives aimed at reducing food waste can lead to a reduction in the total costs incurred by your restaurant?

1) Definitely YES 2) More YES than NO 3) More NO than YES 4) Definitely NO

8. MANAGEMENT OF FOOD SURPLUS

Please indicate which of the following strategies are implemented in your restaurant.

Food surplus in my restaurant is managed by...	YES	NO
Selling food on secondary markets: food surpluses sold at a lower prices to people who are not clients	<input type="checkbox"/>	<input type="checkbox"/>
Donation of food surpluses to charitable organizations to help people with economic and social problems	<input type="checkbox"/>	<input type="checkbox"/>
Sale of food scraps to animal feed manufacturers or for making products that are not intended for human consumption	<input type="checkbox"/>	<input type="checkbox"/>
Recycling or reusing the product within the kitchen in some way.	<input type="checkbox"/>	<input type="checkbox"/>
The food scraps are placed in appropriate containers for composting organic waste.	<input type="checkbox"/>	<input type="checkbox"/>
None of the above. The food scraps are thrown away with regular trash.	<input type="checkbox"/>	<input type="checkbox"/>

9. Have you identified any other ways of managing food surpluses?

If yes, indicate which:

10. I am satisfied with the way my restaurant handles food waste.

1) Strongly disagree 2) Somewhat disagree 3) Neither agree nor disagree
 4) Somewhat agree 5) Strongly agree

11. Local regulations about how to dispose of food waste are clear to me.

- 1) Strongly disagree 2) Somewhat disagree 3) Neither agree nor disagree
- 4) Somewhat agree 5) Strongly agree

12. It is easy for me to follow the local rules and regulations about how to dispose of food waste.

- 1) Strongly disagree 2) Somewhat disagree 3) Neither agree nor disagree
- 4) Somewhat agree 5) Strongly agree

13. Local authorities do a good job of informing my restaurant on food waste disposal regulations and procedures.

- 1) Strongly disagree 2) Somewhat disagree 3) Neither agree nor disagree
- 4) Somewhat agree 5) Strongly agree

14. Doing more to reduce food waste would end up costing my business money.

- 1) Strongly disagree 2) Somewhat disagree 3) Neither agree nor disagree
- 4) Somewhat agree 5) Strongly agree

15. Doing more to reduce food waste would save my business money.

- 1) Strongly disagree 2) Somewhat disagree 3) Neither agree nor disagree
- 4) Somewhat agree 5) Strongly agree

16. Starting April 1, the city of Dubrovnik introduced a new mandatory food waste disposal program for restaurants. How much information do you feel you know about this program?

- 1) None. I never heard about this program.
- 2) Very little. I heard about it but do not know what my restaurant is supposed to do or change.
- 3) Somewhat. I think I mostly know how it works and what I should do.
- 4) A lot. I am confident that I am ready to participate fully in the requirements of the program.

17. COMMENT ON THIS TOPIC OR SUGGESTION FOR IMPROVEMENT

18. Location of the restaurant:

- Old Town (core),
- Pile/Ploce area,
- Lapad/Gruz,
- Other(please specify)_____

19. SEATING CAPACITY

- Less than 20
- 20-40
- 40-60
- More than 60

THANK YOU FOR YOUR PARTICIPATION!

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