

*Bogevska, Z., Berjan, S., Capone, R., Debs, P., El Bilali, H., Bottalico, F., Davitkovska, M. (2020): Household food wastage in North Macedonia. Agriculture and Forestry, 66 (2): 125-135.*

DOI: 10.17707/AgricultForest.66.2.12

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## HOUSEHOLD FOOD WASTAGE IN NORTH MACEDONIA

### SUMMARY

In North Macedonia, there is no precise data about food waste (FW) at the consumer level. For this reason, a survey was carried out in order to evaluate attitude towards FW, knowledge of food labeling, and extent and economic value of FW at households. The total number of the sample was 244. The result showed that 46.1% of the respondents throw very little food while 23.7% do not throw almost anything. Regarding how often the food is thrown per week, 57.1% of the respondents do not throw away food that is still consumable. About 20% throw less than 250 g followed by those who throw between 250 and 500 g (17.1%). Most of the households throw less than 2% of purchased food. The most wasted food groups are milk and dairy products, fruits and vegetables while fish and seafood are the least wasted ones. For 55.5% of the respondents, FW value is less than 5 euro while for 38.8% of them it is between 5 and 25 euro. North Macedonian consumers are aware about FW but there is still a need for more information, management practices, technologies, early childhood education and behaviour change to reduce FW that has environmental and economic impacts.

**Keywords:** food waste, households, questionnaire survey, North Macedonia.

### INTRODUCTION

In the food sector, waste is a major social, nutritional and environmental issue, affecting the sustainability of the food chain as a whole (Berjan et al., 2018; Capone et al., 2014; FAO, 2019; El Bilali, 2019; El Bilali, 2020). The wastage of food occurs at all stages of the food life cycle, starting from harvesting, through manufacturing and distribution and finally consumption, but the largest

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Notes: The authors declare that they have no conflicts of interest. Authorship Form signed online.

Received: 20/02/2020

Accepted: 15/04/2020

contribution to food waste in developed countries occur at home (Marangon *et al.*, 2014). One-third of food produced for human consumption is lost or wasted globally, which amounts to about 1.3 billion tons per year (FAO, 2011; HLPE, 2014). Food waste is both a squandering of precious natural resources (Capone *et al.*, 2014; Scherhauser *et al.*, 2018) as well as a loss of money (FAO, 2011, HLPE, 2014). The value of food lost or wasted annually at the global level is estimated at US\$ 1 trillion (FAO, 2015). About 40 percent of food in the United States today goes uneaten (Gunders, 2012). Ninety million tons of food is wasted in the EU every year (Cicatiello, 2016). The same authors indicate that in Italy, during retailing, the total edible waste would sum up to as much as 40,000 t of food every year. In Sweden, it is estimated that the food industry wastes 171,000 tons, retailers / wholesalers 39,000 tons, restaurants 99,000 tons, and households 674,000 tons for a total of 1,010,000 tons of food each year (Gjerris and Gaiani, 2013). The amount of food wasted per year in UK households is 25% of that purchased (by weight) (Parfitt *et al.*, 2010). Household size, packaging format, price-awareness and marketing appear to influence the levels of food waste in UK (Mallinson *et al.*, 2016).

In North Macedonia, food is lost or wasted throughout the supply chain, from initial agricultural production down to final household consumption.

According to the law on waste management (“Official Gazette” no. 68/2004, 71/2004, 107/2007, 102/2008, 143/2008, 124/2010, 51/2011, 123/2012, 147/2013, 163/2013, 51/2015, 146/2015, 156/2015, 192/2015 and 39/2016) biodegradable waste is any waste which can be digested in anaerobic (absence of oxygen) or aerobic (with oxygen) decomposition processes such as food waste and garden waste, paper and paperboard. In the Strategy for Waste Management of the Republic of Macedonia (2008-2020) and National Plan for Waste Management (2009-2015), systematic and technical measures such as design and construction of installations for reduction of biodegradable waste fractions in landfills are provided. In the Rulebook about the amount of biodegradable components in the waste (“Official Gazette” no. 108/2009), the goal is to achieve a reduction of the amount of biodegradable components in the waste which are disposed to landfill through the implementation of prevention, recycling, composting, biogas production or other ways of use of biodegradable waste. In North Macedonia, there is no precise data of wasted food even for biodegradable waste. According to the National Plan for Waste Management, it is estimated that the amount of biodegradable organic waste is about 150,000 t per year. This amount represents 20% of total waste generated in North Macedonia.

The civil society pays attention and makes efforts in order to reduce food waste. In 2011 was established “FOOD FOR ALL - Food Bank of Macedonia” which is a nonprofit, charity and humanitarian organization that collects excess food, food with tight expiration date, i.e. before the end of use - mainly agricultural, agro-industrial and commercial products. This organization stores, sorts and distributes the food to poor and socially vulnerable categories of citizens, through humanitarian organizations, social organizations and institutions

that are fighting against poverty and hunger. In 2013, Food Bank of Macedonia with others established the “Coalition Against Hunger” that participated in the project “Common voice against hunger!” supported by USAID and the Foundation Open Society. The project aimed to inform and encourage all participants in the food chain to maximize the use of food, redistribution of excess healthy and safe food to social vulnerable citizens before the expiry date and reduction of the amount of food waste and losses of food.

In medium- and high-income countries, such as North Macedonia, food is mainly wasted at consumer level (FAO, 2011). There is a growing body of literature on household food waste in different countries and world regions (e.g. Abiad & Meho, 2018; Mondéjar-Jiménez et al., 2016; Principato, 2018; Schanes et al., 2018), but Balkan countries such as North Macedonia are largely overlooked. Due to lack of food waste data, a survey was performed to evaluate household food waste in North Macedonia. In particular, the survey addressed: knowledge of and perceived relative importance of food waste; attitudes towards food waste; impacts of behaviors regarding food and food management on food wastage; quantity and value of food wasted; and barriers and willingness to behavioral change.

## **MATERIAL AND METHODS**

During the last years the Department of Sustainable Agriculture, Food and Rural Development of CIHEAM-Bari - in collaboration with FAO and other Italian, Mediterranean and international institutions - has undertaken different activities on the sustainability of the Mediterranean food system. In the framework of these activities, a particular attention was devoted to the issue of food waste in the Mediterranean and Balkan regions. Precise and accurate data regarding food waste and losses should be enhanced. In the final declaration of the 10th meeting of the CIHEAM member states' agriculture ministers, held in Algiers in February 2014, the relevance of food waste issue in the Mediterranean countries was strongly stressed (CIHEAM, 2014).

The present paper is based on the results of a voluntary survey in North Macedonia using a questionnaire that was adapted to the Mediterranean context from previous questionnaires and studies on food waste (Last Minute Market, 2014). Moreover, a similar methodology was used in household food wastage surveys in other Mediterranean (Elmenofi et al., 2015; Charbel et al., 2016; Sassi et al., 2016; Ali Arous et al., 2017) and Balkan (Berjan et al., 2019; Preka et al., 2020) countries. The tool used to conduct the food waste survey is a self-administered questionnaire. It was designed and developed in Macedonian language in December 2015 and was made available from March till June 2016 through the Survio website. Participation was entirely on a volunteer basis and responses were analyzed only in aggregate.

The questionnaire consisted of 26 questions. It included a combination of one-option and multiple-choice questions. The questionnaire was developed into six sections. In the introductory part of the questionnaire, the concept of food

losses and waste (FLW) was introduced to inform the respondents. In the first section regarding food purchase behavior and household food expenditure estimation, respondents were asked about shopping habit and frequency, and food expenditure estimation. In the second section about knowledge of food labeling information, respondents were asked whether they were familiar with the “use by” and “best before” food labels. Respondents’ awareness of food waste and frequency of throwing consumable food as well as handling of food waste in their households was given in the third section regarding attitudes towards food waste. In the fourth section about the extent of household food waste, respondents were asked about quantity and commodity groups that were thrown away. Expenditure on food waste was given in the section of economic value of household food waste while respondents’ behavior, willingness and information needs towards reducing food waste were given in the last questionnaire section.

Table 1. Respondents’ profile (n=244).

|                    | Items                                | Percentage (%) |
|--------------------|--------------------------------------|----------------|
| Gender             | Male                                 | 33.1           |
|                    | Female                               | 66.9           |
| Age                | 18-24                                | 22.9           |
|                    | 25-34                                | 36.7           |
|                    | 35-44                                | 28.6           |
|                    | 45-54                                | 7.8            |
|                    | 55 and over                          | 4.1            |
|                    |                                      |                |
| Family status      | Single person household              | 3.7            |
|                    | Living with parents                  | 42.0           |
|                    | Partnered                            | 8.6            |
|                    | Married with children                | 43.3           |
|                    | Shared household, non-related        | 0.8            |
|                    | Other                                | 1.6            |
| Level of education | Primary school                       | 0              |
|                    | Secondary school                     | 0              |
|                    | Technical qualification              | 21.2           |
|                    | University degree                    | 2.4            |
|                    | Higher degree (MSc, PhD)             | 57.1           |
|                    | No formal schooling                  | 19.2           |
| Occupation         | In paid work (fulltime or part-time) | 66.5           |
|                    | Student                              | 21.6           |
|                    | Unemployed and looking for work      | 8.6            |
|                    | Home duties                          | 1.6            |
|                    | Retired/Age pensioner                | 1.6            |

Source: Authors’ elaboration based on the survey results.

Various institutional communication channels for dissemination of the questionnaire were used, such as social media and mailing lists. Data were analyzed using descriptive statistics (e.g. means, max, min), in order to get a general picture of frequencies of variables, using Microsoft Excel.

Table 1 presents the profile of the respondents.

Out of 555 visits, 244 questionnaires were completed while 58 were unfinished and 247 just visited the survey. Therefore, the total number of the sample was 244. The sample was not gender-balanced (66.9% female and 33.1% male). Most of the respondents were young (36.7% aged from 25 to 34 years). More than a half of the respondents (57.1%) have high educational level. Regarding family status, most of the respondents are married with children (43.3 %) followed by those who live with their parents (42.0%).

## RESULTS AND DISCUSSION

### *Food purchase behavior and household food expenditure estimation*

The survey showed that more than two thirds of the respondents (67.8%) buy food products in supermarkets followed by those who buy their food in small market (20.8%). The wide range of available food products at the same location would be also a positive feature that persuades consumers to choose these shopping locations. Only 1.6% of the respondents buy food directly from the farm. About food shopping frequency, there were differences. Most of the respondents (39.6%) buy food every day followed by those who buy it once every 2 days (25.3 %), twice a week (17.1%), once a week (14.3%), every 2 weeks (3.3%) and once per month (0.4%).

Regarding expenses for food each month or food budget, most of North Macedonian households spend more than 150 euro per month (44.5%), which is relatively high, followed by those who spend 100-150 euro per month (29.8%). The shopping list is sometimes used by most interviewees (48.6%). Only 31% of the respondents use always a list for purchasing food. The remaining 20.4% do not use shopping list. Much higher percentage of using the shopping list was found in Karlsruhe (Germany) as well as in Ispra (Italy) where about 70% of households use a shopping list (Priefer et al., 2013). Regarding attraction to offers, more than a half of respondents (53.1%) are sometimes attracted while 37.6% are attracted by special offers. The influence of these offers would have sometimes a great impact on the purchased quantity of food especially during holidays.

### *Knowledge of food labelling information*

Concerning “use by” food label, 68.6% of respondents understand and have good knowledge about the meaning of this label as they think that food should be consumed or discarded by this date. Some of them, about 26.9%, consider that the food is still safe to eat after that date if it is not damaged or spoiled while 4.5% think that food must be sold at a discount after this date. In the case of “best before” label, it is surprising that 86.5% of respondents confuse this label with “use by” as they think that food should be discarded after this date.

Only 9% of the respondents showed good understanding of the meaning of this label. The research in Greece showed better understanding of “best before” label as 58.0% of the respondents answered that food can be consumed 1–2 days later, while 38.5% believed it should be discarded immediately the day after (Abeliotis *et al.*, 2014).

#### *Attitude towards food waste*

Luckily, most of the respondents (92.7%) expressed a high awareness of food waste and they worry about this issue and try to avoid food waste as much as possible. This could be due to the fact that the North Macedonian culture, customs and traditions, which are dominated by a religious character, make the act of throwing food something outrageous. About 6.1% of them are aware of the problems associated with food waste, but they do not think they will change their behaviour in the near future. Nevertheless, a very low percentage (1.2%) did not consider that food waste is a crucial problem.

Regarding how much food is wasted, 46.1% of the respondents answered that the amount of food waste is very little while 23.7% do not throw almost anything. A reasonable amount of food is thrown by 18.8% of the respondents.

About handling of uneaten food, more than a half of the respondents (51.0%) feed animals while 42.9% of respondents answered that they throw it away in the garbage bin. Very few of them (3.3%) do compost.

The frequency of throwing away leftovers or food considered as not good has been also pointed out in the survey. The results showed that only 13.1% of the respondents do not throw leftovers in comparison with 60% of them who declared throwing food less than one time a week. On the other hand, 20% of the respondents throw food leftovers 1 to 2 times a week while 6.9% throw away food leftovers even more than 2 times a week which is considered not good.

As regards activities of respondents that affect the households' food waste, about 59.2% of the respondents eat store-purchased readymade meals (e.g. frozen dinners) while 30.6% eat out or order a takeaway (as a main meal). Only 12.7% of them eat a meal left over from a previous day. This result belongs relatively to young sample of respondents with high education level, which can be highly influenced by western food habit and consumption pattern. About frequency of making a main meal from raw main ingredients, about 60.8% and 16.7% of the respondents cook their meal three-six and seven-ten times per week respectively. Similar results were obtained in Greece where on average people cook 4.7 times per week (Stavros *et al.*, 2017).

The results of the study showed that the main reasons for throwing food at household level were that the food was not edible as result of expiration date (48.6%), which is a result of bad food management at home. About 40.8% of the respondents answered that food is thrown as it was left in the fridge for a long time while 35.9% of them throw leftovers.

#### *Extent of household food waste*

Regarding how often food is thrown per week, 57.1% of the respondents do not throw away food that is still consumable. About 20% of them throw less

than 250 g followed by those who throw between 250 and 500 g (17.1%) (Table 2).

However, in high income countries like Norway, each household generates 8.86 kg total waste per week, of which 3.76 kg was food waste, 2.17 kg edible food waste and 0.60 kg edible food waste in original packaging (Hanssen et al., 2016). In Australia, the average food waste was 2.6 kg per week (Reynolds et al., 2014).

Table 2. Quantity of thrown food per household per week (n=244).

| Answer choices                                    | Ratio (%) |
|---|-----------|
| I do not throw away food that is still consumable | 57.1      |
| Less than 250 g                                   | 20        |
| Between 250 and 500 g                             | 17.1      |
| Between 500 g and 1 kg                            | 3.7       |
| Between 1 kg and 2 kg                             | 0.4       |
| More than 2 kg                                    | 1.6       |

Source: Authors' elaboration based on the survey results.

The survey results showed that the most of households throw less than 2% of purchased food. The most wasted food groups are milk and dairy products, fruit and vegetables. Meanwhile, fish and seafood are the least wasted food products (Table 3).

Table 3. Ratio of thrown food per food group (n=244).

| Food groups                 | Less than 2% | 3 to 5% | 6 to 10% | 11 to 20% | Over 20% | Total (%) |
|-----------------------------|--------------|---------|----------|-----------|----------|-----------|
| Cereals and Bakery products | 69.8         | 13.1    | 9.8      | 4.9       | 2.4      | 100       |
| Pulses and oilseeds         | 78.4         | 10.2    | 6.9      | 3.7       | 0.8      | 100       |
| Fruits                      | 68.2         | 17.1    | 8.2      | 3.3       | 3.3      | 100       |
| Vegetables                  | 67.8         | 16.3    | 8.6      | 4.9       | 2.4      | 100       |
| Meat and meat products      | 70.2         | 15.1    | 6.5      | 5.3       | 2.9      | 100       |
| Fish and seafood            | 89.0         | 5.7     | 0.8      | 3.3       | 1.2      | 100       |
| Milk and dairy products     | 70.2         | 19.2    | 3.7      | 5.3       | 1.6      | 100       |

Source: Authors' elaboration based on the survey results.

Studies commissioned by FAO estimated yearly global food loss and waste by quantity at roughly 30% of cereals, 40-50% of roots, fruit and vegetables, 20% of oilseeds, meat and dairy products and 35% of fish (FAO, 2015). In Switzerland, both on a household level and on a household member level, bakery products and fruits and vegetables were wasted most often, whereas ready-to-eat products were the least often thrown away (Visschers et al., 2015). In Italy and Germany, the most important foods thrown away sometimes or often are (in

ascending order) cheese, vegetables, bread and fruit (Priefer et al., 2013). Fruit, vegetables, bread, and cakes are typically thrown commodities in Denmark (Gjerris and Gaiani, 2013). Recent study in Denmark showed similar results where the dominant food products were fresh vegetables and salads (30% of total food waste) and fresh fruit (17% of total food waste), followed by bakery (13% of total food waste) and drinks, confectionery and desserts (13% of total food waste) (Edjabou et al., 2016).

#### *Economic value of household food waste*

The economic value of household food waste depends not only on waste amount (so also on household composition), and the composition of food waste, but also on household food habits and consumption patterns. Most of the respondents (55.5%) spend less than 5 EUR on food wasted while 38.8% of them spend between 5 and 25 EUR (Table 4).

Table 4. Economic value of food waste generated each month by household (n=244).

| Answer choices        | Responses | Ratio (%) |
|-----------------------|-----------|-----------|
| Less than 5 EUR       | 136       | 55.5      |
| Between 5 and 25 EUR  | 95        | 38.8      |
| Between 25 and 50 EUR | 9         | 3.7       |
| More than 50 EUR      | 5         | 2.0       |

Source: Authors' elaboration based on the survey results.

#### *Willingness and information needs to reduce food waste*

Respondents would be more aware and responsible to avoid wasting food if they had more information of the negative impacts of food waste on the environment (49.8%), suitable packaging of food (31.8%) and negative impacts of food waste on the economy (20.8%). Information about packaging is very important as 20-25% of the households' food waste in Sweden could be related to packaging (Williams et al., 2012). In addition, most of the respondents (44.5%) are willing to get more information about the tips on how to conserve food properly. About a third of the respondents (36.7%) would like to be informed about the freshness of products and 29.4% of them to get information for recipes with leftovers, and organizations and initiatives that deal with food waste prevention and reduction (e.g. food banks).

## **CONCLUSIONS**

Food is wasted throughout the whole food supply chain. Consumers play an important role for the reduction of food waste, not only because a large proportion of waste occurs at household level, but also because all activities along the food chain are targeted to the end-consumer. Food-related behavior and attitude are important factors in determining the amount and extent of food waste. The amount of household food waste depends on food groups. In fact, in North



Macedonia the most wasted foods are milk and dairy products, fruit and vegetables. It seems that there is still some confusion regarding food labels, which increases the amount of food waste especially with the label “best before”. The estimated economic value of food waste is rather low but still a source of concern taking into consideration its share in the household food budget. Awareness campaigns, early childhood education, economic incentives, sharing networks for surplus food, last minute market and intelligent devices to encourage responsible consumer behavior are measures to reduce waste at the end of food chain (consumers).

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