

FOODSTUFFS WASTAGE IN CZECH HOUSEHOLDS

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Abstract

Foodstuffs wastage is a considerable problem having a negative impact on the economic, environmental and social area of life of the society. Financial and human capital has been spent on foodstuffs wastage unnecessarily, there is a burden on the environment through food waste cumulation with the subsequent generation of landfill gas, and water wastage and unnecessary devastation of land follow. Foodstuffs wastage in developed countries opens the scissors between the developed and the developing countries. Czech Republic belongs among the European countries with lower level of household foodstuffs waste. The paper is dealing with the problem of foodstuffs wastage in Czech households. Underlying data have been obtained based on a field questionnaire survey, the outcomes of which have been assessed using statistical methods from the area of verbal variables relationships analysis. Most Czech households throw away bread and white pastries most frequently, meat (chicken, usually) exceptionally only, and vegetables and fruit due to poor storage. 46.59 % of households dispose of food once a week as a rule, but in a small volume only (up to 200 grams), and they estimate the annual volume at about 26 kilo per head. Consumers are not afraid to consume foodstuffs with the shelf life date or the minimum durability expired. It has been found that, the house- hold food wastage is under influence of the community size and the type of living (house, apartment). Food wastage volumes are not connected to frequency of shopping, but to planning of shopping. Households are not adequately informed as concerns the correct storage of foodstuffs and the acceptable ways of food waste handling. The respondents showed willingness to sort the waste if the container is near the dwelling. The survey has shown that, 90 % of households are willing to donate foodstuffs to the needy through a food collection or a national food bank.

Keywords: Food wastage, household, bio waste, food bank, food collection

1. INTRODUCTION

Food is an integral part of people's lives. Considering the immense volumes of food-stuffs production, there are still many people suffering from hunger in the world, though in the developed states of the world unnecessary food wastage happens. All in all, up to one third of the foodstuffs produced in the world is

wasted (Gustavsson, 2011). The households themselves throw away 40 % of meals produced (Ševčíková, 2015). Consumers throw away up to one quarter of the food volume purchased (Institute of Mechanical Engineering, 2013).

It is needed therefore to deal with the question, how to moderate the food waste as much as possible, to stop it in the ideal case. Wastage can be identified during the whole of the food production process, storage, transport and sales, in pubs and households. Many factors affect the food wastage, be it the poor food storage, the strictly defined standards, e.g., defining the appearance of vegetables proceeding to the supermarkets, or a surplus purchase volume by the consumer. Consumers themselves can easily reduce the waste, even without economically demanding measures. They just need to adopt certain rules they will follow consistently during their shopping, food storage, and in case, some food refuse appears, to handle it correctly. The principal measure leading to food wastage reduction is a sufficient awareness of the population.

Each year there are 4 billion tons of food produced in the world, however, caused by imperfect farming system in agriculture, storage and transport of the foodstuffs, the trading system and with the consumers themselves, 30-40 % of the product never reaches the consumption proper (Institute of Mechanical Engineering, 2013). All in all, 1.3 billion tons of food get lost by waste (Paulenková, 2016), what makes it about one third of the global food production (Gustavsson, 2011). Great Britain, United States of America and the remaining Europe produce twice as much foodstuffs than necessary to cover the consumption of their populations (Stuart, 2015). From each inhabitant of Europe and North America 95-115 kilos of food fall thrown away to waste annually (Gustavsson, 2011). In Africa South of Sahara and southern Asia, 6-11 kilos of food per head annually get thrown away only (Gustavsson, 2011).

In Europe the situation in foodstuffs wastage has started to change to the better gradually. Governments of the separate States try to intervene and using legislation to reduce the food wastage. At present, organizations and initiatives are emerging, in order to disseminate information on the wastage problem. In the households the problem is in the inappropriate food storage, and also in buying larger volumes of foodstuffs than they can consume. A great role is played, too, by „action leaflets“, offering lower prices on purchasing larger volumes. A survey led by Stuart in Great Britain has shown another problem, i.e., many consumers do not know the difference between shelf-life time and the minimum usability time (Stuart, 2009).

The result of food waste is the emergence of biodegradable waste. Generally, this is waste that is part of municipal waste. At separation of the bio waste from the municipal waste is aimed the project „Technical assistance of the Cohesion Fund“. The project is aimed at assistance to the mayors of municipalities in the introduction of bio waste separation system from the municipal waste (Hřebíček, 2011). Reduction of bio waste in the municipal waste prevents the formation of methane together with carbon dioxide. Methane has a negative impact on global warming (Hřebíček, 2011).

2. AIM AND METHODOLOGY

The paper examines the problem of foodstuffs wastage in the Czech Republic house-holds as based on data from questionnaire survey. The research deals with household habits in food purchase and Czech consumers information level as concerns the sub-sequent use of food waste.

In the data obtained processing, descriptive statistical methods have been employed and for establishing the relationships between the A and B variables, the χ^2 independence test has been used, with the test criterion:

$$X^2 = \sum_{i=1}^r \sum_{j=1}^s \frac{(n_{ij} - n'_{ij})^2}{n'_{ij}}, \quad (2.1)$$

where n_{ij} ... the empirical frequency,

n'_{ij} ... the theoretical frequency,

$i = 1, \dots, r$, where r is the number of the A variable varieties,

$j = 1, \dots, s$, where s is the number of the B variable varieties.

The χ^2 test criterion is governed by χ^2 distribution with $[(r-1)(s-1)]$ degrees of freedom.

Strength of the relationship between the A and B variables has been established using the Cramér contingency coefficient V:

$$V = \sqrt{\frac{\chi^2}{n(q-1)}} \quad (2.2)$$

where n is the size of the sample, $q = \min(r, s)$, $V \in (0;1)$

3. RESULTS AND DISCUSSION

264 self-employed households participated in the sample survey, with the structure of household members of these corresponding to the general Czech Republic structure. The most frequently represented households were those with two members (47.33 %) and three members (19.7 %). Usually, the household members lived in an apartment and in town (65.15 %). Results of the relationship tests between the variables are presented in Table 1.

Table 1 : Contingency table test results

Relationship	X2 criterion	p-value	Evaluation ($\alpha=0,05$)	Cramér's criterion V
Food wastage frequency and municipality size	11,84	0,00795	Relationship proven	0,21
Volume of food waste and municipality size	10,63	0,03111	Relationship proven	0,20
Food wastage frequency and type of dwelling	7,73	0,05200	Relationship not proven	0,17
Volume of food waste and type of dwelling	7,11	0,12878	Relationship not proven	0,16
Volume of food waste and frequency of purchase	10,22	0,33255	Relationship not proven	0,11
Volume of food waste and purchase plan	14,06	0,02898	Relationship proven	0,16
Willingness for food donation and information level of the donation	1,22	0,54311	Relationship not proven	0,06

Source: Questionnaire survey

The questionnaire survey results have shown that, Czech households throw away 26 kilo of food per head per year. Most often bread is thrown away (35.58 %) and white pastries (25.00 %), meat exceptionally only (mostly chicken), also fruit and vegetables due to excess purchases, bad storage and manipulation. The households have estimated that, up to 100 grams of food fall into waste per person per week.

The food wastage research was divided into three parts. The first part dealt with purchase habits of Czech households since they have a considerable impact on food wastage. Among the purchase habits, capable to influence the food waste volume, there are the shopping plan, shopping frequency and purchase at discounts. A relationship has been proven between cooking planning and purchasing according to the shopping list (Tab.1). It is recommendable to the consumers to plan food preparation and then to purchase according to the shopping list. A relationship has been proven between food purchase frequency and the purchase plan, but the volume of food thrown away does not depend on shopping frequency. The analysis has confirmed a considerable importance of the food preparation plan.

The second part of the research survey was aimed at food wastage as such in the Czech households and at handling of foodstuffs not any more intended for consumption. The survey has documented a relationship between the place of dwelling (town, countryside) and the frequency of food wastage (Tab. 1). Moreover, a relationship has been proven between the municipality size and the money value of food wasted, and between the place of household dwelling and the volume of food wasted. It is obvious that, the place of dwelling has a considerable influence on food wastage. While in the countryside the waste can be composted or used as animal feed, the town households usually lack this chance. The research also has not proved any dependence between frequency, volume or value of foodstuffs and the kind of dwelling (house, apartment). Data on total house-hold waste can be distorted since estimates by separate respondents are the basis. The actual volume of food waste can be larger due to it, same as the value of the waste.

The research has brought a positive finding, namely – Czech consumers are willing to sort the food waste. The chance of foodstuffs sorting could be appreciated by the companies supplying containers for food waste. Consumers could sort the waste, return of nutrients to soil could be supported and no dangerous gas would be generated on the landfills.

The third part of the survey discovered an insufficient awareness of Czech consumers of the possibility to donate food to the needy through non-profit organizations. The respondents reacted positively on the question of food donation (Tab. 1) but the survey demonstrated low awareness of the public concerning the food bank. The National Food Collection is known to some only.

3.1 Food wastage awareness

Consumers' awareness of food wastage consequences is very important. The consequences are essential for separate households as well as for the complete State economy. The households can save annually up to several thousand crowns. According to the questionnaire survey the consumers' awareness as to correct foodstuffs storage is insufficient. Consumers are not enough informed of the alternatives how to deal with the food waste. Respondents' will to sort the food waste has been manifested. Many consumers do not realize the fact that, by throwing away some food, not only the food as such is being impaired, but human labour, too, and energy, water, land, environment. According to research, the most risky group as concerns food waste volumes are youngsters aged 18 to 29 years from towns over 100,000 inhabitants (IKEA, 2015). This group can be addressed using mobile applications and advanced media. Information on food wastage should be supplied by supermarkets, too, in order to establish a total evidence of unsold foodstuffs volumes. Some supermarkets' approach in the war against food waste can be appreciated positively: they offer for sale at a discount foods that are unsuitable in shape or weight.

3.2 Reduction of food wastage

Every consumer can reduce the food wastage. When purchasing food it is important to consider the real volume needed in the household, the plan of cooking on the next days, and to critically consider shopping at discounts. Research confirmed the links between shopping planning and frequency of food wastage. Consumers should keep records how much food there is at home, to prevent accumulation of food that is undergoing expiration. Further they should learn to correctly interpret information on the date until when the food is to be consumed and the date when its health harmlessness is no more guaranteed. All this in order to prevent food waste. Farmers could offer information on correct fruit and vegetables storage.

The solution for the future can be smart refrigerators and other IoT applications. The fridges are connected to mobile application; they watch the current fridge contents and can show the current state to the consumer at any time. Anyway, smart fridges so far have not been made affordable for most of the population.

Another chance how to avoid food waste is the introduction of a new code mark able to contain also the information on the date of the recommended food consumption. These are the GS1 DataBar codes. Many European countries (Austria, Ireland, Switzerland) have already accepted the new coding, and suppliers in the Netherlands are obliged to mark their goods this way. In the Czech Republic so far the COOP company only have switched to the GS1 code marking. The GS1 code marking applies first of all to perish-able foodstuffs, which represent 50-60 % of sales in the supermarkets. Out of this share, 5-7 % are discarded still before being put on the counter. The total sales of the merchants may decrease this way by up to 4 % (GS1 Czech Republic, 2016).

3.3 Food waste management

The questionnaire survey has presented the fact that, Czech households are willing to sort the bio waste but they have no chance to do so. Usually there is no bio waste container close to their place of living or a collection yard. Considering the fact that, most of the respondents were from apartment households, then ownership of a compost cannot be assumed. Anyway, places for common composting have been established lately, and also the inner composters, so called vermicomposters, can be employed. Food waste can also be exploited to return some nutrients back to soil. The problem of food waste management is again connected with the consumers' awareness.

3.4 Food donation

It has been found by the questionnaire survey that, 90 % of households would be willing to donate food. Anyway, the number of consumers who actually donate food to food banks has not been high in the research. The difference in the numbers of responses between willingness to donate, and real participation in the donation could be caused by insufficient awareness of consumers. The respondents noted in the

questionnaire survey of their knowledge of food banks from the TV screen. It is needed therefore, that the food banks increase their activities, too.

4. CONCLUSION

Food staffs wastage represents a problem with negative impact on the economic, environmental and social spheres. Both the investment and non-investment means expended as well as human capital costs of the foodstuffs production are lost due to the wastage. Besides this also the environmental burden develops by pumping and moving water, by unnecessary taking nutrients from soil and by unsuitable disposal of food waste the landfill gases arise. The food waste contributes to opening the imaginary scissors between the developing and the developed countries. In the developed states a surplus both of production and consumption develops and many times the food wastage, too, while in those developing countries there is lack of food for the population.

Big volumes of raw food materials are lost during the harvest already, during marketing, in the catering facilities and in the households. Food wastage can be followed in the distribution and logistics flows. Foodstuffs are transported from long distances, stored and sorted before being placed on the market counters.

Food wastage is a significant problem that can be reduced through introduction of some measures. In order to reduce food waste at the household level, every consumer can master measures reducing the volume disposed of. These are, e.g., during shopping time already, to prepare a purchase list derived from the cooking plan, and to go shopping more often. To learn distinguishing the „consumption date“ from the „minimum durability date“ on the goods, to learn correct foodstuffs storage not to admit unnecessary losses of the food purchased due to molds, bruises and rots. Wastage can be reduced by a better estimate of raw materials needed for food preparation, in order to prevent waste of thermally prepared food.

Food already unsuitable for consume can be used otherwise. Foodstuffs and food residues can be sorted, bio-waste containers can be obtained and pets and animals can be fed this way or the residues can be composted.

An important factor in the battle against food wastage is the sufficient consumers' awareness. At the household level it is needed to raise general awareness of correct food storage, of the correct understanding the consumption dates on foodstuffs packaging, or on the possible subsequent use of foodstuffs.

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