

Sustainable consumption of bakery products; a challenge for Czech consumers and producers

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Abstract: The objective of this paper is to investigate the level of bakery product wastes in Czech households, economic, social and institutional factors which affect bakery products consumption and wastes and which role producers, retailers and consumers themselves play in it. The research deploys quantitative assessment of the relationship between prices, income and consumed quantities and qualitative assessment (surveys and focus groups) of opinions and attitudes of consumers, producers and retailers to wastes. To do the analysis we consider the model of social practices. We addressed a sample made by 260 respondents. The results suggest the actual wastes of bakery products are relatively low (less than 5%), because of quite large recoverability of bread and roll surpluses in households. The critical issue for bread and rolls consumption is quality and “freshness”. The notion of freshness of bakery products has changed since the mid of the 1990s. Furthermore, the food is not considered to be wasted when it is either used as a feeding or composted. The norms on handling with bread in households are likely not as strong as in the past, nevertheless, most of the participants in the focus groups agreed that bread is food which should not be wasted.

Keywords: bakery products, food consumption alternatives, food waste, household survey, social practices, sustainable consumption

Reducing food consumption and wastes attracts increasingly public attention in the context of global food security. According to the European Commission about 100 million tonnes of food is wasted annually in the EU, of it 40% happen at the retail and consumption level (DG SANCO 2014). In 2011, the OECD Green Growth Strategy identified reducing food waste as one of the future challenges to meet the growing global food demand while lowering the pressures on resources and the climate (OECD 2011). The recent communication from the European Commission (2014) proposes that Member States develop national food-waste prevention strategies and attempt to ensure the reducing of food waste in the manufacturing, retail/distribution, food service/hospitality sectors and households by at least 30% by 2025.

There is a worldwide range of policies applied or considered to reduce food consumption and wastes; on the one pole there are restrictive measures (Takata et al. 2012; Ushikubo 2013), on the other pole the countries concentrate on raising public awareness, education and voluntary measures (WRAP 2011). As

pointed out by Mont (2002) reducing food consumption as a principle is difficult because there are large groups of people for which it is desirable to increase the intake of nutrients. Thus, voluntary measures are preferable, however, these require a certain level of understanding coming from rational, ethical and cultural motives.

Bread and bakery products belong to food with a relatively high level of wastes at the household level in Europe (Prieffer et al. 2013; Katajajuuri et al. 2014). In the Czech Republic there was found that this kind of products even rank to the most frequently wasted food (CVVN 2014B).

The consumption of bread and bakery products has undergone a considerable change in recent years in the Czech Republic as the supply changed in the ways of distribution, the range of products and their qualitative characteristics, price, etc. Just only the figures of the shares of bread and bakery products consumed indicate significant changes in the branch. While in 1989 the average annual per capita consumption accounted 55 kg for bread and 33 kg for

other bakery and cereal products, the shares reversed during 25 years and in 2013 they reached 42 kg for bread and 68 kg for other bakery and cereal products (CzSO 2014).

In order to work on a strategy for the reduction of consumers wasting it is to understand consumers' motives and habits of their purchase and consumption, as well as their desires and critics of bread and bakery supply and retail distribution. Consumer's behaviour is influenced by consumer's needs and purchasing possibilities. This behaviour varies from different kinds of food consumed – each customer may see different value/desire in each food (Dědková a kol. 2010). It is to examine if the wasting relates rather to the way of life and consumers themselves (such as their values scale, life speed or other incentives) or if it relates more to the variety supplied and way of sale coming from the production and retail side.

The objective of our research is to investigate economic, social and institutional factors which affect consumption and wastes of bread and bakery products in the Czech Republic; if there are tendencies of the shift toward a more sustainable consumption (reduction of wastes), and which role producers, retailers and consumers themselves play in it. It is an explorative research to provide information on the challenges in the investigation of sustainable food consumption and food waste.

The paper is structured as follows: in the next section we review literature on the subject of sustainable consumption and food waste and introduce the conceptual framework of our study. It is followed by the specification of the methodology, i.e. research methods and data. After that we shortly introduce the recent development of the consumption of bakery products in the Czech Republic. We present results of our research in three consequent sections: the analysis of households' behavior concerning bread consumption and waste; an insight in social practices concerning bread and rolls; and results from interviews on consumption alternatives with two processors. Findings are summarized and discussed in the concluding paragraph.

CONCEPTUAL FRAMEWORK

The term “sustainable consumption and production” emphasises the role of consumption and consumers in achieving improvements of global sustainability. While most attention has been paid to the regulation

of the production sectors so far, the recognition that changing attitude of consumers might yield much larger effects is at its outset. The argument for focusing on consumption rest in the fact that consumer choice plays a leading role in orienting production. The concept of sustainable consumption includes three areas of changes

- Reducing consumption;
- Shifting consumption pattern to a more sustainable one;
- Reducing waste and recycling.

As reducing food consumption as a principle is difficult (see Mont 2002) most policy and research attention concentrates on shifts toward more sustainable food products and on food losses. The former includes issues like reducing meat consumption or increasing the consumption of locally produced food and organic products (e.g. Duchins 2005). Concerning the latter, about one-third of the food produced for human consumption is lost or wasted every year (Gustavsson et al. 2011). Parfitt et al. (2010) distinguishes between food losses and food wastes, arguing that the former relates to early stages of the food supply chain (FSC) and refers to a system which needs investment in infrastructure. In contrast, the term food waste is applied to later stages of the FSC, and generally relates to behaviour of food suppliers and consumers. Priefer et al. (2013) in the accord with Ventour (2008) identified four main reasons for food being wasted in households: ‘left on the plate’, ‘passed its date’, ‘looked, smelt or tasted bad’, ‘went mouldy’ and ‘left over from cooking’. According to survey results of Gusia (2012) main reason for food being wasted in households are: ‘too long in fridge’, ‘wrong storage’ and ‘cooked too much’. These investigations indicate that, in spite of being well educated, people in the developed countries either lack knowledge how to preserve food, or they do not care or that their life style simply prevent them to manage food in a proper way.

In spite of being identified on the side of consumers, moderating these hurdles is not possible without changes in production, infrastructure and social contexts. In this respect some authors (e.g. Mont 2002) propose concept of sustainable product-service system (SPSS) in which consumers buy utilisation of products (mobility) instead of products (cars). According to Mont (2002), the advantage of adopting product service approach enables to seek consumption options which contribute to environmental protection without

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reducing consumer welfare. This linking of production and consumption together is appreciated by Mylan (2015) when proposing to adopt the social practices approach from the sociology of consumption (Warde 2005) in studying sustainability of consumption. The basic idea of social practices is that people use and consume many resources and products while they engage in routine activities. Practices usually entail number of element like material, cultural aspects, norms, habits and skills. Practices are dynamic, they reproduce and change. Thus Warde (2005) and Mylan (2015) argue that patterns of consumption cannot be changed only by educating or persuading individuals to make different decisions, but that the nature of the practices themselves must be changed.

In her research, Mylan (2015) contrasted the success of the lighting transition and so far the failure in introducing low temperature washing. She argues that the former was prone to changes since consumers were looking for diversity of lighting, but also that constituent elements of social practices (lighting use) were only loosely coupled among themselves while the spread of low temperature washing was blocked by tight coupling between constituent elements: Contemporary understandings of clean clothes (meaning) are deeply linked to the use of automatic washing machines, synthetic detergents (material) and high temperature.

Garrone et al. (2014) introduced a conceptual model of surplus food generation and management (called ASRW, i.e. Availability-Surplus-Recoverability-Waste) along the integrated food supply chain. *Food availability* is defined as all food passing throughout the food supply chain and households. *Food availability* includes three food categories: *consumed food*, *surplus food* and *food scrap*. *Consumed food* is the edible food that is delivered through the traditional market and is consumed by humans. *Surplus food* is the edible food that is produced, manufactured, retailed or served but for various reasons is not sold to or consumed by the intended customer. *Food scrap* consists of non-edible food, e.g. leftovers at the manufacturing stage or the non-edible parts of otherwise edible food. See the central scheme in Figure 1 and later comments when describing our conceptual scheme.

Garrone et al. (2014) considers four main *surplus food* management techniques: feeding humans (e.g. donations to food banks), feeding animals, waste recovery (e.g. composting, production of energy), and finally environmentally unfriendly food disposal. The transition from surplus food to food waste is regarded as a degree of recoverability. Surplus food recoverability for human consumption is inherently different at different stages in the food supply chain and for different kinds of products. Garrone et al. (2014) argues that the degree of recoverability at

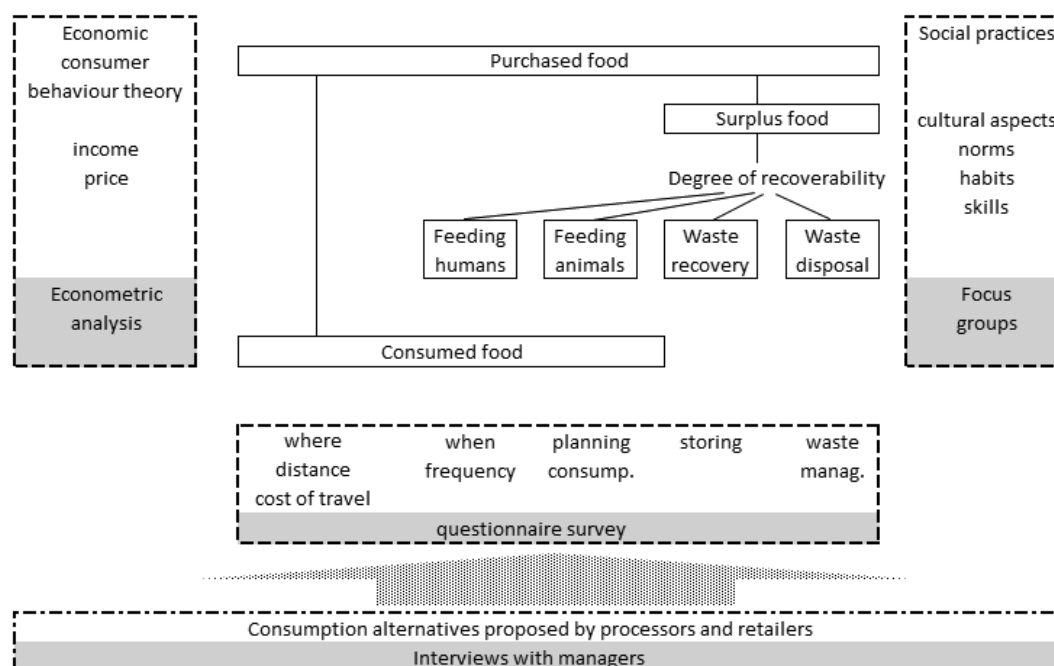


Figure 1. Conceptual framework for investigating bakery product wastes, based on Garrone et al. (2014) and extended

the household consumption stage is low as a result of a low value of intrinsic recoverability and high management intensity. The intrinsic recoverability of surplus food is very low because products are either not consumed before the end of their shelf life or they are cooked but not consumed. As a consequence, surplus food is mainly managed through waste disposal. The disconnection across individual households, and the absence of special equipment to rapidly cool the food at home reduce recoverability of surplus food too.

In our conceptual framework for studying sustainability of bakery products consumption we adopted the model of Garrone et al. (2014) and enhanced it in several respects (Figure 1). First we are considering economic variables like price and income determining bakery products availability (purchase) and thus constituting space for food surplus. In contrast to these we also consider that purchase, management and waste of bakery products are too large extent governed by social practices as showed by Warde (2005) and Mylan (201).

There are number of behavioural aspects which have their reasons in both household budgeting (including the cost of time, other transaction costs) and social practices. We also think that consumer behaviour has to be confronted (and explained) with actual consumption alternatives offered by processors and retailers.

MATERIALS AND METHODS

To make the conceptual framework operational we use five methods in our analysis: (i) descriptive methods to demonstrate the recent changes in consumption of bakery products, (ii) econometric analysis of consumer behaviour, (iii) questionnaire survey on consumption and waste of bakery products, (iv) focus groups on social context of food consumption and (v) interviews with managers of bakeries. The descriptive analysis provides the context to our investigation and thus is not included in Figure 1, the other four are included and associated with the area of investigation.

The main purpose of the econometric analysis was to investigate the effect of price and income development on bakery consumption. We used annual data from the household surveys of the Czech Statistical Office (CzSO) for two socio-economic groups of respondents: economic active (ea) and pensioners (pn)

and the period 1993–2013. We estimated income and price elasticities using Cobb-Douglass demand function and Stone's analysis (both with imposed homogeneity restriction). In the former model, prices and income were deflated by the general consumer price index (CPI). In the latter, we used Stone's Price Index (Deaton and Muellbauer 1980). These rather simple models were used mainly because of low number of observations (21 years, 20 for first differences). The models were estimated in first differences to avoid the problem of serial correlation. The considered three level of budgeting: (i) total consumption split in three categories: food, manufacturing goods and housing&services; (ii) food consumption divided in bakery&cereal products, animal protein products and other products; and finally the more detailed level of bakery and cereal products encompassing bread (containing rye flour and weighting more than 350 g), rolls&baguettes (predominantly wheat products) and other bakery&cereal products.

The questionnaire consists of 26 questions and aimed at the issues located below the Garrone's core scheme in Figure 1. The questionnaire is divided into two parts – the identification part and the main research part. The identification part includes 11 questions on the characteristics of the respondents including their awareness of the food waste problem. The second part consists of 15 questions, including binary answer, multiple choice and ranking questions. It basically examines two areas of consumers' behaviours: households' shopping habits and households' handling of bakery products at home including evaluation and management of bakery wastes. The questionnaire was posted on the web (survio.com) and the survey was conducted purely through internet for three weeks in January 2015. The respondents (presumably the main bakery products purchasers in households) were encouraged through personal and social networks of the authors of paper, thus by no means the sample can be regarded as fully representative, although its composition is surprisingly balanced in terms of geographic location and age (see the paragraph on Social Practices). To evaluate the questionnaire we used frequencies of answers and chi2 tests to check associations between selected questions (variables); to assess the associations between characteristics and consumer preferences or the choice of shopping place (i.e. figures which are expressed in percentages of use) we used ANOVA and MANOVA.

Four focus groups (FG) on social practices were conducted. For each focus group we invited 10 rep-

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representatives of households (preferably the main purchasers of bakery products) of which at least 7 turned up at the event. The discussion lasted between 1½ and 2 hours. It was structured in three parts: (a) on consumption patterns, (b) on quality attributes of bread/rolls “product service” and (c) on social norms of bread consumption. The FGs were facilitated by the authors.

We have envisaged 8 interviews with the managers of bakery processors and retailers, finally completed 3 interviews (one small and one large processor and one small retailer). The both processors have got own nets of outlets, but mostly they supply the other retailers and catering services. The interview guidelines include: (i) changes in product offers in terms of sustainable consumption (e.g. shelf-life, packaging, size), (ii) motives for such changes and (iii) consumption alternatives provided or envisaged by processors and retailers..

RESULTS AND DISCUSSION

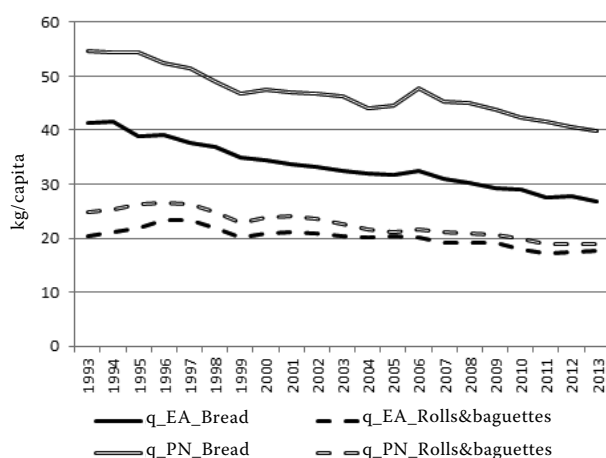
Some basic facts on consumption of bakery products

Over the last two decades the share of food on total expenditure declined from 29% to 22% for the households of the economic active head (EA-HH) and from 39% to 24% for pensioners (PN-HH) in nominal terms. Some decline can be observed also for real expenditure (by 2 and 7 percentage points for EA-HH and PN-HH respectively), which in turn mean that

consumption slightly reduced. The share of bakery products on food expenditure increased for the both household groups from 14 to 17% in nominal terms while the share of consumption (i.e. real spending) stagnated (EA-HH) or slightly declined (PN-HH). The actual consumption (i.e. real expenditure) of bakery products increased by 11% and 3% for EA-HH and PN-HH respectively. The contrast between the relative decline in the consumption structure and increase in the real expenditure refers to the real income increase and more pronounced increase of real figures for fruits and animal proteins.

As showed in Figure 2, the consumption (in kg/capita) of the two bakery categories of our interest declined over last 20 years; significantly for bread while moderately for rolls&baguettes. There is no difference in these trends between the two household types. If we look in the data we will find that at the same time, the consumption of sweet pastry and other cereal products increased by roughly 30% for EA-HH; the PN-HH consumption increased by almost 40% for sweet pastry while stagnating for other cereal products.

It is likely that the decline of bread consumption is largely affected by price. The unit price for bread (i.e. the price for which bread was purchased in the surveyed households; expenditure/consumption in kg) tripled over last 20 years, the unit price of rolls&baguettes increased 2.5 times while the unit price of other cereal products increased only by 60%. The enormous price changes might suggest shift from quantity toward quality for bakery products.



EA – Economic Active, PN – Pensioners

Figure 2. Development of bread and rolls consumption, 1993–2013

Economic behaviour of consumers of bakery products

Of the estimates of the demand system we report here only the stream line Food → Bakery&Cereal products → Bread/Rolls&Baguettes. Our estimates are completed with more advanced estimates of own price and income elasticities from the most recent literature in Table 1. Our estimates of food own price and income elasticities as well as those of ERS/USDA (1996) are a bit lower than those of Brosin (1999) and Dybczak et al. (2010). The differences might be due to models and the data (period, time series or panel data). Nevertheless we can judge that food consumption in general is not too elastic. In contrast the elasticities of Bakery&Cereal products seem to be pretty income elastic (in respect to the disposable

Table 1. Price and income elasticities of bakery products

	Stone	C-D model, homog	Brosig (1999)	Dybczak et al. (2010)	ERS/USDA
<i>Price elasticities (uncompensated)</i>					
Food in Total Expenditure	−0.543	−0.329	−0.760	−0.679	−0.338
Bakery&Cereals in Food Expenditure	−1.136	−0.653	−0.620		−0.22
Bread in Bakery&Cereals		(−0.022)			
Rolls&Baguettes in Bakery&Cereals		−0.542			
<i>Income elasticities</i>					
Food in Total Expenditure	0.386	0.386	0.650	0.894	0.477
Bakery&Cereals in Food Expenditure	0.949	0.890	0.800		0.272
Bread in Bakery&Cereals		(−0.058)			
Rolls&Baguettes in Bakery&Cereals		0.609			

Stone: Stone's analysis (own), C-D: Cobb-Douglas demand function (own), () insignificant model

Brosig (1999): Normalised Quadratic Expenditure Function. ERS/USDA International food demand for year 1996

Dybczak et al. (2010): The Quadratic Almost Ideal Demand System

Reported are only significant figures at the level $\alpha = 10\%$

food budget) close to 1, except for estimates of ERS/USDA while response to price is rather moderate (note that Stone's model suggests that it is very elastic). To our disappointment our two simple models have appeared not much suitable for analysing the detailed demand for bakery and cereal products. The only significant results have been obtained for Rolls&Baguettes subgroup with moderate income and own price elasticities. In respect to bread, we can hypothesize that the product is inelastic which will modify our assumption from the previous paragraph, that rising price was behind the decline of bread consumption. More research is definitely needed; likely there is need for using a model in which we can control for theoretical assumptions (adding-up, curvature, symmetry).

Qualitative aspects of purchase and consumption of bakery products (of our interest) were included in the questionnaire survey which will be analysed in details in the next section on Social practices. We asked about shares of four categories of breads and rolls&baguettes: common bread (wheat and ray flour

mix, 1 kg loaf with little other ingredients like seeds and nuts), special bread (usually smaller loafs, higher share of ray flour, whole grain or with high share of nuts, seeds or grains; also what might be called "traditional" or "regional"), common rolls (80 g, plain, wheat flour only) and special rolls and baguettes (multi grain, high fat, whole grain, various special shapes or with coverage or filling). For the categories "special" it is also typical that their unit (kg) price is significantly higher than for the categories "common".

On average, common bread is most preferred among the respondents of the survey; more than one third of purchased bakery products (36%) are common bread and one fourth is special bread. Thus the both categories of rolls and baguettes represent around 40% of bread and rolls purchases (Table 2). It can be showed that with age the consumption of bread, and particularly common bread increases. And vice versa, consumption of common rolls and baguettes declines with age. The differences in bread and rolls consumptions among the age categories (6, in Table 2 they are aggregated to 2) are significant

Table 2. The percentage shares of bread and rolls consumptions according to the age categories

Age categories	Common bread (%)	Common roll&baguettes (%)	Special bread (%)	Special rolls& baguettes (%)	Total (%)	Number of households
All	36	23	25	16	100	251
19 to 49	33	25	26	16	100	156
over 50	43	18	23	16	100	95

Source: own examination

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Table 3. The percentage shares of bread and rolls consumptions according to the economic employment categories

	Common bread (%)	Commons rolls&baguettes (%)	Special bread (%)	Special rolls (%)	Total (%)	Number of households
Jobless	48	21	21	10	100	6
Student	32	15	40	13	100	16
Student with a job	31	21	27	21	100	36
Full time job	36	24	24	16	100	150
Part time job	30	37	16	18	100	9
Retired with a job	48	19	19	14	100	10
Retired	46	16	24	15	100	24

Source: own examination

at $\alpha = 0.01$, using ANOVA or MANOVA except for special rolls&baguettes.

We investigated consumer preferences (in terms of the four bread and rolls categories) also in respect to other household characteristics like economic status, household size or education. Although the percentage shares of bread and rolls consumptions vary across these characteristics (e.g. Table 3), the differences are not statistically significant at $\alpha < 0.1$.

Social practices

In line with the conceptual framework we looked at social practices rather than at preferences (see the previous section) in the qualitative analysis – questionnaire survey. The questionnaire was filled by 251 household principal purchasers of bakery products. There were 70% women and 30% men in the sample. Almost two thirds of respondents reached university education and most of the others completed secondary school (only 1% had only basic education). Two thirds live in the city overreaching 100 thousand inhabitants and one fifth lives in small town and villages under 5000 inhabitants. It definitely makes our survey biased toward educated respondents in larger sites and thus not really representative of the Czech population. The age and the economic status of respondents, as well as the size of households are pretty balanced in terms, that all important classes are sufficiently represented. In total nine of ten respondents indicated that they sort the waste which was deemed as an indicator of environmental concern of answering households. It is well in line with the survey of the Centre for Public Opinion Research (CVVM 2014A), that 83% of the population sort waste always or frequently.

Concerning the shopping place; our respondents make on average 64% of bakery product purchases in supermarkets and 22% in specialized bakery shops; 5% of respondents indicated that they bake some bread or rolls home, which in turn also mean that on average 5% of consumed bread and rolls are made home. There is no statistically significant relationship between household characteristics and the place of shopping. Although the tendency to large shops (supermarkets) might seem very high, it is below the estimate (84%) of Incoma GFK (2014) for all food and home chemical products.

The consumers-respondents were asked to order five factors potentially affecting their bread and rolls purchasing habit: the routine, the price, the shop proximity, the quality/freshness of the product and the origin of the bakery good/ingredients. The most surprising finding (Table 4) is the distinct dominance of “quality and the freshness” aspect in buyers’ decision making (57% of respondents put it at the first place, 75% on the first and second place) while price is regarded as the secondary factor. It is in contrast to generally accepted view that Czech households are entirely focussed on price. Actually price got the first place in only 7% of answers. “Quality and freshness” got the first preference across the age, economic status, size and other characteristics more or less equally/proportionally. A quarter of respondents follow routine and shop proximity was important for older and retired respondents. Women prefer distinctly (in terms of statistical significance at $\alpha = 0.05$) “quality and freshness” and while “shop proximity” is for them a marginal aspect, while men exhibit rather equal distribution in these aspects. The geographical origin of bakery products plays a minor role in purchase decision making. More than half of respondents regard it as the less important factor.

Table 4. Key factors for deciding on buying bakery products

	Routine	Price	Shop proximity	Quality/freshness	Origin
1 st preference	24	7	11	56	2
2 nd preference	12	34	16	19	19
3 rd preference	16	30	36	8	11
4 th preference	25	20	21	17	17
5 th preference	23	9	16	0	51
Total	100	100	100	100	100

The figures in columns show which share of households put the stated preference to the factor stated in the headings of the column.

Source: own examination

The second part of the questionnaire was focused on wasting bakery products in the households. Concerning wastes of bakery products, the survey results show rather their low level: 63% of respondents estimated that they throw away significantly less than 5%, and 76% of households declared wasting up to 5%. The ability to utilise maximum of the bought quantity is significantly higher for the age group over 50 years, and “singles” are those having least bakery product wastes (a bit in contrast to Canali et al. 2014 suggesting that singles tend to waste more in general). Most probably the ability to plan purchases and manage consumption is behind it, as it followed also from the discussions in focus groups. In contrast, busy households with children might find planning and management difficult.

The most declared reasons for wastes are lack of freshness and low quality of bakery products (here likely that bread or rolls get off (get hard, lose taste) soon after bought) – both were stated by roughly 50% of respondents. Uneaten rests and other reasons are

rather rare except for the youngest generation. In line with our conceptual framework we regard these reasons constituting food surplus. Actually, only a part of the surplus is purely wasted – thrown away non-ecologically (Table 5). Most of the survey respondents and most participant in focus groups stated that they feed animals with the uneaten surpluses or compost them. Since 2 answers were allowed in the survey questionnaire, respondents often combined the option “consume everything” with the option “feed animals”, obviously, because they did not consider feeding animals as wasting. From the focus groups we know that households often keep old bred and rolls for animals of their relatives or friends. Thus we can assess that about 35% of respondents recover bakery surpluses in human feeding (cooking stuff like crumb), about 47% of respondents recover bakery surpluses at least partly in ecological way (composting, feeding animals). About 18% of respondents dispose all food surplus in the non-ecological way. Note that we got about 3% of inconsistent answers (consume all, throw

Table 5. The ways how the surveyed households treat bakery surpluses, along age groups

	Consume everything, no waste (feeding humans)	Composting	Feeding animals	Waste disposal
Number of responses	127	8	110	57
Age groups	the shares within the age groups (%)			
All	45	2	44	28
19–29	49	2	45	34
30–39	49	3	49	23
40–49	40	9	40	21
50–59	71	2	42	4
over 60	45	2	44	28

Consumers were enabled to choose more options. The figures show the share of consumers of all ones in the category who chose the option.

Source: own survey

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away). Exceptionally high ability to recover bakery surpluses exhibited the age category 50–59, only 4% of respondents throw bakery products in dustbins.

The underlying aspect of food wastes is the emergence of food surpluses. Various factors contribute to it. We have already discussed the purchasing habit. Price strategy of retailers, packaging size and variety of offered bakery products and purchase planning are other contributors to food surpluses (see also Cox and Downing 2007 and Williams et al. 2012). Concerning the former, i.e. price drop in special offers, our sample does not exhibit significant effect of price reductions on food wastes. It can be also showed that the dissatisfaction with the quality might contribute to larger food surpluses, while the satisfaction with size is rather inconclusive. It is worth to stress that the formulation of the question on the satisfaction with packaging size and offered variety of products is rather complicated and its interpretation is not easy in spite of being its association with bakery waste percentage statistically significant at $\alpha = 0.05$. The analysis of the questions on purchase planning and wastes reveals (sig. at $\alpha = 0.01$) that longer planning period results in lower food wastes (surpluses). In contrast to it, most of respondents state shorter period of planning, one fifth for only a day. This is confirmed by the participants of focus groups who often mentioned coordination of bakery products purchases by phone calls, which witnesses rather about short term planning.

We created the focus groups (FG) in the way that they differentiate by age, i.e. two FG included people younger than 45 years and the other two people over 45 years. It appeared rational, since the different age groups differ in their opinions while the same age groups expressed consistently similar attitudes. There were three rounds of discussion. The first round concerned the position of bread and rolls in consumption patterns, and some of the results were already mentioned when we evaluated the questionnaire survey. The second concerned the notion of the quality of bakery products and we are not including the results in this paper. The third round concerned two social aspects: the social role of bread and rolls consumption and the norms of the consumption/wasting.

The older generation prefers rye-wheat bread over rolls, they consider bread to be basic food, but they do not find any strong social role of bread consumption. Nevertheless, after some discussion they could agree that offering good bread to guests or bringing bread to the visit might be appreciated. Although it

was obvious that there are health reasons for their preference to bread, they did not find health concerns or presenting themselves as people following healthy diet as relevant.

In contrast, the younger generation have more or less equal preferences to bread and rolls & baguettes. Because of small size and large variety of tastes, rolls are suitable for snack or supper. They see at least partly, consuming bread and rolls as pleasure, they are willing spend more for it. Younger people see also bread and rolls as a mean for presenting their health concerns (presenting themselves as followers of healthy diet). They are finding relevant bringing good bread or rolls to visits/parties or paying attention to the quality of bread and rolls when inviting guests.

The both generations regard the thesis “bread does not throw away” as a norm, however neither group added stronger attribute like “bread is God’s gift”.

Response of bakery producers – consumption alternatives

The aim of the interviews with bakery processors is to examine what are their practises in respect to sustainable consumption. An especial focus is on consumption alternatives provided by these processors. The interviews have been conducted with the managers of two baker companies. One of them was the huge processing company (LC), having roughly one third share on bakery product sales in the country, the second one was a medium size enterprise (SME) with a regional scope.

Both companies confirmed a continuous effort to capture and to follow new consumers’ trends and to come with innovative products convenient for different consumers clusters. Both companies stipulated that their product innovations aim at sensual characteristics, size and product durability. In addition, the LC is concerned with the technology development which will better enable retailers to offer fresh products for lower energy costs. The managers stressed that rolls and baguettes are principally products for immediate consumption. A day is a maximum, but the products are most tasty if they are consumed within 4 to 10 hours after baked. Thus either finishing products in the market place or flexible and continuous (several times a day) delivery is important to offer consumers fresh products. The SME sees these issues as a constraint which it cannot deal with and focus its strategy on morning sales close the places where

people concentrate when travelling to the work. In contrast, the LC is proactive: first it produces rolls (as well as bread) continuously (24 hour a day) and deliver them throughout the day to super markets or in their own shops; second the LC offers prepared products to be finished (baked) in the shops which can last with the retailer for 5 days while they are not frozen, thus energy saving.

Both processors realized increasing interest of consumers in prolonging durability of bread. The SME manager emphasizes that their bread has got qualitative characteristics which enables keep bread tasty for 4 days at home. The manager believes that keeping the traditional rising technology based on rye flour is sufficient to maintain the expectations of consumers in respect to durability of bread. The SME does not provide much marketing research; it works by the trial and error approach to address the needs of consumers.

The main customers of the LC are the large retail chains. The individual enterprises of the LC serve customers in the circle up to 100 km radius. In this context the LC sees two ways how to enhance freshness of bread on the shelf: (i) to reduce the time lag between the production and the shelf availability and to supply the shops flexibly during the day; and (ii) to introduce aseptic packaging which will prevent the development of moulds even if open and closed again, while maintain most of the sensual characteristics of bread.

The managers of the both companies state that consumers gradually appreciate more softness of bread and rolls as an indicator of freshness which goes against the traditional notion bread and rolls being crisp and crunchy.

CONCLUSION

Our research indicates that bakery product wastes are rather low (below 5% of purchased amount) which is a bit in contrast with the results of CVVM (2014B) where bread was stated as the most wasted food by 27% (first answer) and 42% (first and second answer) respondents. These high figures, and thus second place after fruits and vegetables, were one of the reasons why we decided to focus our research on bakery products. Evidently, results of both investigations are difficult to compare since the measurement and likely also the understanding of wastes are not the same. It is clear that our respondents do not consider

feeding animals as wasting. Low figures for bread wastes are also reported by Williams et al. (2012) for Swedish households.

We found by our own demand analysis, meta-analysis and from the survey and focus groups that price is less important in decision on purchasing bakery products than it is generally thought. Large retail chains – their shops: supermarkets and hypermarkets are the main shopping place for bread and rolls&baguettes (64% of purchases); nevertheless their use is significantly lower for these product than for purchasing food in general (over 80%, Incoma GFK 2013).

The critical issue for bread and rolls consumption is “freshness” of the product. The notion of freshness of bakery products has changed; consumers want them to be soft (not crunchy) nowadays. It followed from the discussions in the focus groups that storing bread at home is an issue: some people complained that it goes off (moulds develop) faster than earlier, others emphasized the advantage of freezing sliced bread and rolls and defrosting them when needed and only in the amount which will be consumed immediately. Since this practice (i) might not be acceptable by some consumers and (ii) might also be viewed as energetically unsustainable, the bakery processors try to prolong freshness and stability of bread by going back to traditional high content of rye flour and/or by using aseptic packaging which can be open, close and reopen several times, protecting the product against the development of moulds for 5 and more days.

The norms on handling with bread in households are likely not as strong as in the past, nevertheless, most of the participants in the focus groups agreed that bread is food which should not be wasted. It seems that bread lost a lot of its social role; presenting themselves (household) by offering good bread was not deeply anchored among the participants.

Our research confirms that people are aware of the problem of food waste and are concerned, as it has already been showed by other surveys e.g. CVVM (2014A) on the attitudes of Czech citizens to global problems, CVVM(2014B) on food wastes or by Hebakova et al.(2015) in results of Citizens Consultation on sustainable consumption.

The issue of sustainable food consumption and production is largely recognised at the EU level; it is an integral part of the Europe 2020 Strategy; more explicitly it appears in The Roadmap to a Resource-Efficient Europe highlighting the food sector as priority area for taking action – calling for: “... incentives

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for healthier and more sustainable production and consumption of food and to halve the disposal of edible food waste in the EU by 2020.” For Czech citizens the concept is rather new (Hebakova et al. 2015) and national debate, policies and strategies are rather limited (Ratinger et al. 2014).

Priefer et al. (2013) proposes 14 policy options how to reduce food waste of which 3 aim at the policy itself (setting targets, collecting data and coordinating with food safety policy), 6 at providing a range of alternatives for consumers to safe food by improving the food system (labelling, delivering products at right time, opening alternative supply channels, supporting food redistributive programmes and consumer aided networks) and finally 3 options for stimulating a change of behaviour (educating consumers, introducing economic incentives and fees on waste). Undoubtedly, it holds for sustainability of bakery product consumption in the Czech Republic, too.

As stated at the beginning of this paper, the presented research has been designed as exploratory. Obviously, more has to be done in all areas identified in the conceptual framework.

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REFERENCES

- Brosig S. (1999): Die private Nachfrage nach Nahrungsmitteln im Transformationsprozess Tschechiens und Poland. (Private Demand for Food in the Transformation Process in Poland and Czech Republic.) [PhD Thesis.] Georg-August-Universität Göttingen.
- Canali M., Östergren K., Amani P., Aramyan L., Sijtsema S., Korhonen O., O’Connor C. (2014): Drivers of current food waste generation, threats of future increase and opportunities for reduction FUSIONS. The European Commission, Bologna.
- Cox J., Downing P. (2007): Food Behaviour Consumer Research: Quantitative Phase. Wrap, Banbury UK. Available at <http://www.wrap.org.uk/sites/files/rap/Food%20behaviour%20consumer%20research%20quantitative%20jun%202007.pdf> (accessed Aug 11, 2015).
- CVVM (2014A): Občané o globálních problémech. (The Citizens about the Global problems.) Press releases on related to the survey of the citizens’ concerns of the environment and the related policy issues. The institute of Sociology, the Czech Academy of Sciences. Available at <http://cvvm.soc.cas.cz/ekologie/ceska-verejnost-globalnich-problemech-kveten-2014>
- CVVM (2014B): Občané o způsobu zacházení s potravinami – duben 2014. (Citizens about the way of food handling – April 2014.) Press release. The institute of Sociology, the Czech Academy of Sciences. Available at <http://cvvm.soc.cas.cz/ostatni-ruzne/postoj-obcanu-k-plytvani-potravinami-duben-2014>
- CzSO (2014): Statistika rodinných účtů. (Household Statistics.) The Czech Statistical Office. Available at www.czso.cz
- DG SANCO (2014): Stop food waste. Directorate Health and Consumers. Available at http://ec.europa.eu/food/food/sustainability/index_en.htm
- Deaton A., Muellbauer J. (1980): Economics and Consumer Behavior. Cambridge University Press, Cambridge.
- Dědková J. a kol. (2010): Analýza nákupního chování. (Analysis of shopping behaviour.) 1st ed. Technical University in Liberec, Liberec.
- Duchin F. (2005): Sustainable consumption of food: a framework for analysing scenarios about changes in diets. Journal of Industrial Ecology, 9: 99–114.
- Dybczak K., Tóth P., Voňka D. (2010): Effects of Price Shocks to Consumer Demand. Estimating the QUAIDS Demand System on Czech Household Budget Survey Data. Working Paper Series 8, Czech National Bank.
- European Commission (2014): Towards a circular economy: A zero waste programme for Europe. COM(2014) 398 final, Brussels. Available at <http://ec.europa.eu/environment/circular-economy/pdf/circular-economy-communication.pdf>.
- Garrone P., Melacini M., Perego A. (2014): Opening the black box of food waste reduction. Food Policy, 46: 129–139.
- Gusia D. (2012): Lebensmittelabfälle in Musterhaushalten im Landkreis Ludwigsburg. Ursachen Einflussfaktoren – Vermeidungsstrategien. (Food waste in the sample of Ludwigsburg district households. Reasons, factors of influence and waste reduction strategies.) [Diploma thesis.] Environmental techniques study programme. University of Stuttgart. Cited in Priefer et al. (2013).
- Gustavsson J., Cederberg C., Sonesson U., Van Otterdijk R., Meybeck A. (2011): Global food losses and food waste – Extent, causes and prevention. A study conducted for the International Congress SAVE FOOD! at Interpack 2011. Düsseldorf, Rome, FAO. Available at <http://www.fao.org/docrep/014/mb060e/mb060e00.pdf>

- Hebakova L., Michalek T., Ratinger T. (2015): Národní zpráva o občanské konzultaci k udržitelné spotřebě. (National Report on the Citizens' Consultation on Sustainable Consumption.) Technology Centre AS CR.
- Incoma GFK (2014): Press Releases to the Shopping Monitor. Available at <http://www.incoma.cz/en/default.aspx>
- Katajajuuri J.M., Silvennoinen K., Hartikainen H., Heikkilä L., Reinikainen A. (2014): Food waste in the finish food chain. *Journal of Cleaner Production*, 73: 322–329.
- OECD (2011): A Green Growth Strategy for Food and Agriculture, Preliminary Report. OECD, Available at <http://www.oecd.org/greengrowth/sustainable-agriculture/48224529.pdf> (accessed May, 2011): 20–21.
- Mont O.K. (2002): Clarifying the concept of product-service system. *Journal of Cleaner Production*, 10: 237–245.
- Mylan J. (2015): Understanding the diffusion of Sustainable Product-Service Systems: Insights from the sociology of consumption and practice theory. *Journal of Cleaner Production*, 97: 13–20. doi: 10.1016/j.jclepro.2014.01.065.
- Parfitt J., Barthel M., Macnaughton S. (2010): Food waste within food supply chains: quantification and potential for change to 2050. *Philosophical Transactions of the Royal Society*, B 365: 3065–3081.
- Priefer C., Jörissen J., Bräutigam K.R. (2013): Options for cutting food waste – Technology options for feeding 10 billion people. IP/A/STOA/FWC/2008-096/Lot7/C1/SC2-SC4: 12. Available at [http://www.europarl.europa.eu/RegData/etudes/etudes/join/2013/513515/IPOL-JOIN_ET\(2013\)513515\(SUM01\)_EN.pdf](http://www.europarl.europa.eu/RegData/etudes/etudes/join/2013/513515/IPOL-JOIN_ET(2013)513515(SUM01)_EN.pdf)
- Ratinger T., Hebakova L., Michalek T., Stikova O., Mrhalikova I. (2014): Sustainable food consumption – the Case of the Czech Republic. *Review of Agricultural and Applied Economics*, 17: 65–73.
- Takata M., Fukushima K., Kino-Kimata N., Niwa C., Toda T. (2012): The effects of recycling loops in food waste management in Japan: based on the environmental and economic evaluation of food recycling. *Science of the Total Environment*, 432: 309–317.
- Ushikubo A. (2013): Recycling of food waste in Japan. OECD. Available at http://www.oecd.org/site/agrfcn/Session%204_Akikuni%20Ushikubo.pdf
- Ventour L. (2008): Food waste report – The food we waste. Waste & Resources Action Programme (WRAP), Banbury.
- Warde A. (2005): Consumption and theories of practice. *Journal of Consumer Culture*, 5: 131–154. <http://dx.doi.org/10.1177/1469540505053090>
- WRAP (2011). New estimates for household food and drink waste in the UK. Waste and Resource Action Programme. Available at <http://www.wrap.org.uk/content/estimates-household-food-and-drink-waste-uk-2011>
- Williams H., Wikström F., Otterbring T., Löfgren M., Gustafsson A. (2012): Reasons for household food waste with special attention to packaging. *Journal of Cleaner Production*, 24: 141–148.

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