



WASTING FOOD – AN INSISTENT BEHAVIOUR

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ABSTRACT: The wastage of food occurs at all stages of the life cycle of food, starting from harvesting, through processing and production via trade and finally consumption. Some of the incurred food wastes are not suitable for human consumption any more, while others could be eaten without restrictions. The paper focuses on the latter food waste and reports about food waste in different stages of the life cycle of food in general, the reasons of wasting food with special focus on household level, the impact on waste management systems and on the environment, on the difficulties to overcome food wasting behaviour and options to design prevention measures. Also the ethical issues of wasting food are discussed by taking e.g. donation for people in need or formation of social groups like freegans into account.

1. INTRODUCTION

Obviously the economic status in developed countries has reached such a high level that thousands of tons of wholesome edible food are thrown away as waste at every stage of the marketing system. Several studies indicate food wastage of about 25 % of the national available amount of food. As food is one of the most resource and energy demanding product group, the prevention of wasting food could be an important contribution to save not only resources but also reduce environmental impact during production, transport and waste management of food. As nobody intends to waste food from the first, various individual and outer circumstances and behaviour lead to the wastage of food.

2. FOOD WASTE ALONG THE LIFE CYCLE OF FOOD

The wastage of food occurs at all stages of the life cycle of food, starting from harvesting, through processing and production via trade and finally consumption. Some of the incurred food wastes are not suitable for human consumption any more, while others solely do not meet specific criteria for further trade although they could be eaten without restrictions. Such food products are represented by seasonal goods, storage surplus, over production, food which is incorrectly labelled and that is damaged during transport. Warehouse charges also influence the decision to keep or throw away products and - possibly one of the main reasons - the sometimes overextended requirements of our society result in unnecessary over production.

Other food waste has past the use-by date due to storage surplus and over production but could have been eaten without any restrictions before that date. The reason could be for example an unexpectedly high crop yield in one specific year which may cause over production or the buying behaviour of consumers which often is hard to predict.

From a technical point of view it is interesting that there is an overall lack of data concerning this kind of "waste". The reason for this could be that e.g. over production and storage surplus are often viewed as the result of imperfect planning or as an indicator for a general insufficient quality of the products. Therefore an exceptional occurrence is considered which could have simply been avoided and it is not worth paying extra attention to. In addition, the different options available for disposing food wastes complicate the estimation of the amounts. Statistical recordings are not designated to differentiate between wastes which are still suitable for human consumption and others.

Few investigations and estimations have been described in literature using properly applied methods, assumptions and conditions to investigate food losses. In addition to the scarcity of data there is also a lack of comparable units and bases for allocation, as illustrated by the following examples. In 1997 agricultural economists of the US Economic Research Service conducted a survey on food losses on the US market and concluded that approximately 27 % of the amount of food available for human consumption in the US is lost during the stages of retail, food service and household (Kantor et al. 1997). Estimations for Switzerland indicate a loss of food from production to the plate in the household ranging between 20 and 25 % (Bundesamt für Gesundheit 1998). The Austrian supply balance sheets note long term average losses of about 16 % of the amount of food available for human consumption in Austria for both fruits and vegetables. The figures summarise the losses due to storage, transport, processing, packaging and sorting at the agricultural level as well as on the market (Statistik Austria 2005, Statistik Austria 2007). In contrast to the data from the US and Switzerland, there is no information about the edibility of the losses reported within the Austrian supply balance sheets. Thus, the proportion of losses due to over production or discrepancies according to legal restrictions is not specified.

2.1. Agriculture

Corresponding to the Concepts and Definitions Database (CODED) of the European Union one of the seven major categories of losses in agriculture is the category "losses due to market conditions (withdrawal of fruit, vegetables, etc.)" (Eurostat 2000). This kind of loss was numbered by Jones (2005) who analysed the loss of oranges caused by economic reasons with about 15 % at the orange fruit industry in Florida. Other sources indicate losses up to 30 % in strawberry industry in Spain (Schoepp 2007). Even in Austria where agriculture is structured in comparable small businesses only crops which meet first quality are harvested, others are putrified (Anonymous 2006). Although these crops could be used for better purpose, some of them do not affect the waste management system because they are left on the trees or on the field and become part of the natural degradation process.

2.2. Food processing industry, food trade and gastronomy

As mentioned above, average data from food industry and trade can hardly be found within literature. Besides the difficulties to receive information about the total amounts of wasted food, facts about the kind and the edibility of the wasted food are almost impossible to investigate for a longer time period. In order to get an idea about the overall amounts, some times statistic tables can be used. An example for available food waste statistics is given below. Unfortunately this statistic can not be used properly due to considerable differences between the recorded years which can not be explained.

According to § 6 of the Viennese Waste Management Act waste collection and treatment companies are obliged to report the handling of non hazardous wastes within Vienna to the City Council (Wr. AWG 2007). Unfortunately, the data are published only irregular for some years within the waste management concepts of the City of Vienna. Table 1 lists the amount of expired food items defined by the code according to the Austrian Standard ON S 2100 in mass per year. As "expired food" (corresponds to European Waste Catalogue (EWC) codes 02 02 03, 02 03 04, 02 05 01 and 02 06 01 "materials unsuitable for consumption or processing" as well as 16 03 06 "organic wastes other than those mentioned in 16 03 05" (EPA 2002)), "expired food conserves" (corresponding EWC codes see expired food) and "expired pleasing products" (EWC code 02 03 04 and 02 07 04 "materials unsuitable for consumption or processing") can be summarised as food products which could not be sold within the expiry date, it is assumed that those wastes could be avoided by a more efficient logistic system. By comparing the data from the different years, considerable fluctuation of the figures from one year to the next clearly can be observed. The

reason for that is not identified but there are some influencing factors which should be kept in mind. Assuming that expired food is given to a transport company to be transferred to somewhere else to be handed over to a waste collection or treatment company there, the obligation to report according to § 6 of the Viennese Waste Management Act is inapplicable. Thus, several amounts of expired food and other wastes are not registered. Due to this data gap the amounts which are displayed in Table 1 only show parts of the real amounts of food waste which is generated within Vienna.

In order to estimate the losses of edible food in retail, in 2003 a ten-week survey was performed in cooperation with a large food retail chain in Vienna. During this time all products designated for disposal but which were seemingly still usable were provided by the employees of two subsidiaries of the discounter retail chain in a separate place in the storage area. The reasons for phasing out the products were, for example, one decayed piece in the package with several eggs, vegetables or fruits, damage to the packaging without spoiling the contents, seasonal products after the season (e.g. Easter bunny made of chocolate) and others. Once every day the products were collected, sorted, weighed and then transported to a social welfare service where the food was prepared and further distributed to people in need. During the ten weeks, in sum 5.3 tons of food were collected, of which 87 % were transferred as edible food. The product range was dominated by vegetables which accounted for 45 % of the products as well as fruits which contributed 27 % of the transferred food. Other common product groups included eggs, coffee, meat, cheese, sweets and non-alcoholic drinks. Figure 1 illustrates the condition and gives an idea about the range of the transferred food items.

The amount of bread was higher than the capacity of the available car, thus most of it had to be left at the supermarkets. Furthermore, the demand for bread of the social organisation involved (the largest shelter for homeless people in Vienna) was satisfied with the transferred amount and therefore the bread would

Table 1. Amount of expired food items in Vienna (MA 48 1998, MA 48 2002, MA 48 2007), *according to ON 2005.

code*	name	mass per year [t/a]			
		1994	1997	2000	2005
11 102	expired food	3.00	0.60	133.84	837.27
11 116	expired food conserves	197.00	0.00	8.91	0.00
11 401	expired pleasing products	14.00	8.80	22.43	6.70
sum		214.00	9.40	165.18	843.97



Figure 1. Edible Food collected at supermarkets, transferred to social organisation (Schneider and Wassermann 2004)

have been disposed of anyway. An average of 45 kg edible food per day and store or 13.5 tons of food per year and store could be collected from food discount chains (Schneider and Wassermann 2004). This figure corresponds to those found in literature for US supermarkets where approximately 53 kg of food per day and store are wasted (Jones 2004).

A study from Sweden analysed four different restaurants and school kitchens to measure the various kinds of food losses, storage (improper storage) and preparation losses, serving losses (left on serving dishes, in bowls) and discarded leftovers (not served) as well as plate waste. The results indicate that around 16 % of the purchased food was cooked and ready to eat but ends up as loss whereas plate waste was the largest proportion with 10 % (Engström and Carlsson-Kanyama 2004). A survey conducted in Hong Kong showed that only 13 % of the interviewed people stated to eat up the portion received in restaurants. To support food waste prevention, parts of the gastronomy of Hong Kong fine customers who do not eat up their food on the plate (Blume 2007). Similar considerations are reported from Brazil where the penalty should make the public attention aware of the environmental impact of beef production.

2.3. Household level

To estimate the proportion of food wastes in the residual waste of households, methodologies such as enquiries or waste sorting analyses can be used. The results of enquiries give qualitative information like kind and frequency of wasted food and reasons for wasting food on the basis of self reported behaviour of the respondents. Furthermore, information about interrelated conditions (e.g. level of employment, age of household members) and behaviour (e.g. buying, cooking and diet habits) can be gathered. The method of waste sorting analysis of residual waste is used to find information about the quantitative composition of residual waste whereas these data are important for monitoring and planning of waste management systems. It has to bear in mind that this method only gathers data about the items disposed of into the residual waste bin and that therefore other disposal paths such as kitchen sewer, pets, home composting and source separated collection are not considered.

The results of waste sorting analyses conducted in several Austrian regions indicate an average portion of 6 to 12 % of residual waste which is original and partly used food. Original food means any food with unopened packaging or food sold loose which was not used at all, e.g. sealed packed cheese, whole vegetables or fruits. Partly used food implies e.g. a half loaf of bread, half-full beverage package or stale crackers. Additionally, leftovers (plate waste) such as cooked vegetables and meat, boiled rice or bitten sandwiches can be found up to 6 % within residual waste. The results indicate a regional difference of food waste in such a way that less food waste can be found in rural area. In this regard it has to bear in mind that the options for alternative disposal ways are manifold in rural areas comparing to urban regions. Thus, for example animal feeding may have an impact on food waste proportion in residual waste from rural areas (Schneider and Obersteiner 2007).

The reasons for wasting original and partly used food from households are manifold and it can be assumed that different influencing factors contribute and that their impacts superpose one another. Beginning at the point of sale, one of the first reasons for wasting food is buying behaviour. Persons who shop without any idea about their food stock and expected food intake will buy food items they will not eat. Thus, special offers such as “buy two, get one free” could be continued with the note “...and waste it”.

Analyses have shown a significant positive correlation of a high amount of original food within residual waste from households and a high proportion of persons aged between 20 and 59 within the area under investigation. Level of education and full-time employment also correlate with those food wastes in a positive way (Wassermann and Schneider 2005). These results suggest that persons with full-time employment may have less time to and/or do not want to plan and use their food stock. Also monetary effects could play a more important role within households with higher income who are able to afford wasting food more easily in comparison to those with lower income level. Furthermore, results of a study indicate a fostered spoilage frequency of food items within households where the persons do not often eat in and cooking is unusual, so more canned food and less fresh products are used (Lebersorger 2004).

On the contrary, it was found that people older than 50 years tend to throw away less food than younger age groups. This result was obtained by interpreting the results of waste sorting analyses as well as looking at the results of interviews where more than 60 % of interviewed people aged over 60 years said they never throw food away (Wassermann und Schneider 2005). A possible explanation for this correlation could be found at the particular system of values of the so called "post war generation" where saving and recycling were particularly important (Homburg and Matthies 1998). However, financial restrictions of retirees or the usually increasing amount of time spent at home might also be a factor of influence.

3. IMPACT OF FOOD LOSSES ON THE ENVIRONMENT AND THE WASTE MANAGEMENT SYSTEM

According to a life cycle assessment study, food products rank among the five most resource-demanding and polluting product groups in Sweden. For other countries similar results are obtained. Different studies about energy use indicate that food is the second most energy demanding group after housing (Engström 2004). Thus, it would be interesting to assess the environmental impact of food which is produced but never eaten. Looking at different life cycle assessment studies the lack of adequate data on food losses is mainly solved through application of personal assumptions or by ignoring the losses within the life cycle assessment (e.g. Andersson and Ohlsson 1999, Engström 2004). The latter decision means in the case of large losses that the ignoring of the problem neglect the need for an increased food production in order to achieve a given amount of food consumption. Moreover, results for energy and resource demand are underestimated with a higher quantity of pollutants being emitted. This considerations show that food losses do not only have an impact on the environment at the stage of waste management but also within the previous stages of life cycle.

Considering the expenditures of labour, energy and resources which have to be spent along the life cycle of food, the only warrantable reason is the real intake of food as human nutrition resource. The conversion of food to compost or energy can always be only the second best option of using food. Besides food waste which can not be prevented has to be collected, transported and treated whereby several emissions are released. Furthermore, food waste causes manifold technical problems in the management of waste. Due to the organic substances biodegraded under aerobic and anaerobic conditions from the time food waste is thrown into the waste bin, problems occur at almost all stages of the waste management system. This is especially true since residual waste with a specific organic content or heating value has to be pre-treated before landfilling, in line with recent legal guidelines. Additionally, unpleasant odours are developed, waste bins and the collection vehicle are contaminated, various types of animals are attracted to feed on the waste, and several environmentally toxic liquid and gaseous emissions are generated by the biodegradation processes. In the following, potential impacts of food wastes are identified and discussed against the current situation of disposal in Austria.

For animals, the proportion of food waste as food source depends on the particular anatomical and physiological feasibility as well as on the specific conditions of the surrounding environment. Within regions with a dense human population, e.g. in suburbs or urban areas, the amount of scavenged food items accounts for an essential proportion of the total feed of the animal. Results from different investigation methods indicate that some animals such as badger or sea gull feed mainly on human food items (Meyer et al. 2003). The access to the food waste begins at the waste bin, remains at several treatment plants (e.g. composting facility) and has the highest relevance at the landfill. The troubles and risks for persons occurring from animals which feed on wasted food in residual waste are well-known from countries like Canada or USA. There bears and other animals are attracted by the smell of food waste from waste bins which can lead them to trouble – both themselves and humans.

According to the Austrian ordinance on compost quality only biogenic substances should be put into the bio bin to assure highest compost quality (Kompostverordnung 2001). Thus, packaging material should not be thrown into the bio bin to avoid unfavourable contamination of the compost. Hence, although residues of cooked food (e.g. plate wastes) could be dropped into the bio bin, some waste associations and compost producers are not satisfied by having those inputs. They cause increased odour (first of all due to meat containing food) and a raised content of salt (due to industrially processed food) as well as the appearance of bugs and animals. The presence of plate wastes leads to a higher demand of bulk material

due to the increased level of moisture and decreased proportion of holes. Besides the troublesome packaging fraction, food wastes have a positive affect on the composition of humic substances due to the good biological availability.

In 2004 around one quarter of the Austrian residual waste was processed by mechanical-biological treatment (BAWP 2006). Within the process of mechanical-biological treatment food wastes leads to an increased level of reactivity due to the good biological availability. This may cause an extended period of treatment of the waste depending on the concept of the plant. Whereas carbon is decomposed and redesigned during mechanical-biological treatment, nitrogen remains in not stabilised converted structure. Potential impacts on short and long term leachate due to food nitrogen are not analysed in sufficient way.

The high water content of food waste is an advantage for treatment options such as anaerobic digestion plants. As food has a high gas generation potential due to the good biological availability of the content, food wastes are a welcomed input at those treatment plants. In addition, this treatment option fulfils the requirements of several legal requirements concerning hygienic and epidemic issues. Due to sophisticated unpackaging facilities also large amounts of expired food items such as canned food can be treated automatically at anaerobic digestion plants.

Landfills are known as a large contributor of green house gases due to the organic carbon content which is converted under anaerobic conditions mainly into methane. Within the European Union methane emissions from landfills together with those from agriculture contribute with 30 % to the total methane emissions. This means that landfills and agriculture cause the largest proportion of total methane emissions within EU member states (Lechner 2004). In the USA, landfills hold the largest proportion of anthropogenic methane sources at all (EPA 2005). In 2004 only 15 % of the Austrian residual waste was landfilled directly without any pre-treatment (BAWP 2006). This is due to the Austrian landfill ordinance (based on Council decision 2003/33/EC) which bans the disposing of waste with a total organic content (TOC) higher than 5 mass-% (Deponieverordnung 2008). The last exceptions to this ordinance will phase-out in 2009 which mark the end of untreated food waste disposed at Austrian landfills. Completely different is the situation regarding this topic in other regions. Approximately one third of the more than nine-thousand tons of solid waste dumped in the landfills of Hong Kong each day are food leftovers, an amount which has more than doubled within the last five years (Blume 2007).

Besides the advantages of the pre-treatment of residual waste concerning the methane emissions, there is also an effect on the attractiveness of landfills as food source for animals. An indication of the negative impact of pre-treated residual waste on the behaviour of herring gulls showed a count of those birds in Germany. Compared to the previous years the number of herring gulls decreased in the German inland up to 60 % in winter 2005-06. The experts clearly identify the decreasing amount of untreated waste with a high content of food waste as reason for the decline of bird population (Wahl et al. 2007). In contrast, the best photo spot for bears in Canada is still the local landfill.

The largest amount of Austrian residual waste, 60 % in 2004, are processed in thermal treatment plants (BAWP 2006). Due to the high water content food wastes decrease the heating value of the residual waste. But considering the already increased heating value caused by the proportion of plastics this circumstance is not really mentioned as disadvantage at all.

4. PREVENTION MEASURES FOR FOOD WASTE

The production of a sufficient amount of food is an important issue for human being and several incidences in the past resulted in specific national and international plans to ensure the supply of people with food, at least for developed countries. Thus, more food is produced than needed because potentially losses due to weather incidences, diseases or pests should have as little consequences as possible on food supply. This behaviour is comprehensible but implies several perspectives which may lead to wastage of food. As the topic is an integrated one and also implies agricultural, national and international trade and subsidy policy as well as global politics, in the following only some prevention options are discussed and a few examples are given.

4.1. Donation to people in need

Prevention of the wastage of edible food within the level of agriculture, industry, trade and gastronomy could save a lot of effort, resources and emissions but is difficult to implement. In particular on level of agriculture where the weather dependency is high but also on level of the other three stakeholder where assumptions and prognoses have to be done to estimate the expected sales often amounts of edible food are wasted due to surpluses, over production, unprofitable prices as well as not marketable dimensions or weight of food items. Besides the option of more effective planning there is another possibility to prevent food waste from the commercial levels of the life cycle of food.

As the problem of wasting edible food was identified some decades ago, since the late 1960's so called food banks and food rescue programs have been established in the US. Typically food banks are organisations that collect food from a variety of sources, save the food in a warehouse and distribute it to hungry families and individuals through local social welfare organisations. Most food banks tend to collect less perishable foods such as canned goods due to their supra-regional range of activities and the longer shelf life of those products. Food rescue programs rather collect perishable and prepared food and distribute it to organisations that serve hungry people. The organisations served by food banks and food rescue programs include community centers, shelters, soup kitchens, food pantries, childcare centers and senior programs. The largest charitable hunger relief organisation in the US is Second Harvest Food Banks which is a national network of food banks. It coordinates the distribution of surplus food and grocery products through about 200 food banks and 50,000 charity organisations which supply 25 million people in the US (Second Harvest s.a.).

Similar organisations which collect edible but unmarketable food items and distribute them to social welfare services or directly to people in need also operate in several other countries all over the world. The European Federation of Food Banks was established in 1986 and twenty years later there are 202 food banks operating in 18 European countries. According to the reports given on their website, in sum 282,000 tons of food were collected and distributed to social welfare organisations in 2006. It is estimated that these products are worth several hundred million Euros and approximately 4.3 million people are supported by these goods (European Food Banks s.a.). In addition, there are several other charity organisations which are driven by ecclesiastical organisations and charitable societies named e.g. "Tafeln" (table) or "Sozialmärkte" (social supermarkets) which manage the collection of edible food items and distribute them to social welfare organisations or directly to people in need. For example, 19 social supermarkets operated within Austria and supported more than 19,000 people in need in 2007. These organisations collect edible food which otherwise would be wasted from farmers, industry and trade. The food items are sold at a symbolical price (about one third of the usual price) to people in need. Thus, those people who have the possibility to cook and eat at home are supported with food without giving alms.

4.2. Usage of wasted food through freegans

In addition to the institutional use of edible food which would be wasted, private people benefit from the surplus of food at the level of commerce. According to Wikipedia (2008), freeganism was developed in the mid 1990s as an anti-consumerism lifestyle whereby people live with minimal participation in common economy and by using a minimum level of resource demand. Although a freegan usually have the economic ability to buy goods, the consumption is almost limited to those things which are wasted by others. Thus, freeganism includes the collection of food which is wasted by supermarkets as well as recycling of wasted transportation vehicles, clothes and other goods. The practiced approach is also known as "dumpster diving" in North America, "bin diving" in the UK or "containern" in Germany. Due to legal restrictions regarding ownership structure and intrusion, freegans often come into conflict with shop owners or the law. To avoid the foraging at the waste bins some shop owners resort to radical means by hanging up markers with the label "attention, rat poison" (Haarhaus 2006). As a consequence also those people who depend on food donation of shop owners have to look for another food source.

4.3. Food waste prevention on household level

According to their prevention potential, the food waste fractions from households can be differentiated into four groups: original food, partly used food, leftovers (plate waste) and preparation residues (see also chapter 2.3). The first three mentioned food waste fractions could be potentially prevented by different measures whereas preparation residues, e.g. egg shells or vegetable peels, hardly can be avoided when fresh food is used for cooking (Schneider and Obersteiner 2007). Figure 2 shows the composition of food waste (original, partly used, leftovers, preparation residues) from residual household waste which was surveyed in two different regions by comparable waste sorting analyses (Wassermann and Schneider 2005, Schneider s.a.). Although the overall proportion of the food waste within the first region was approximately half (13 %, figure 2 left hand) as much as within the residual waste of the second region (24 %, figure 2 right hand), the composition of the food waste fractions are quite similar. With over 30 % preparation residues represent the main part of the food waste which hardly can be prevented. In total, original and partly used food account for about half of the food waste found within residual waste from households. Leftovers contribute about 18 % to the amount of food waste. This results show that about two-thirds of the food waste found in residual waste from households could be theoretically prevented.

Although this sounds simple, it is difficult to find an appropriate measure to implement food waste prevention at the household level. This is due to various reasons such as age, income, time spent at home and others which determine the food wasting behaviour of people, varying according to their lifestyle. This leads to the problem that the buying, consumption and wasting behaviour can not be changed immediately by setting a specific action. It is assumed that 80 % of nutrition and environmental behaviour is habitual. Thus, the decisions are driven by automatic actions and are not scrutinised. As a consequence, the habit has to be made aware in a first step and additionally it is very insistent against changing efforts. In addition, also situational factors such as smell, hunger, appetite, attractive special offers cause to act on impulse during shopping tours (Lebersorger 2004).

Thus, prosperous prevention measures concerning food waste should be designed for long term application with a comprehensive and integrative approach. Although there is a lack of experience and assessments about the effect of already implemented measures, there are some measures which are known as supporting tool combating food waste at household level. The availability of information about origin, production conditions, seasonality, the correct handling concerning storage and preparation, test methods of the maturity as well as preparation options of specific food items will not only support the direct handling of the food but also impart values. According to findings, values seem to be important regarding

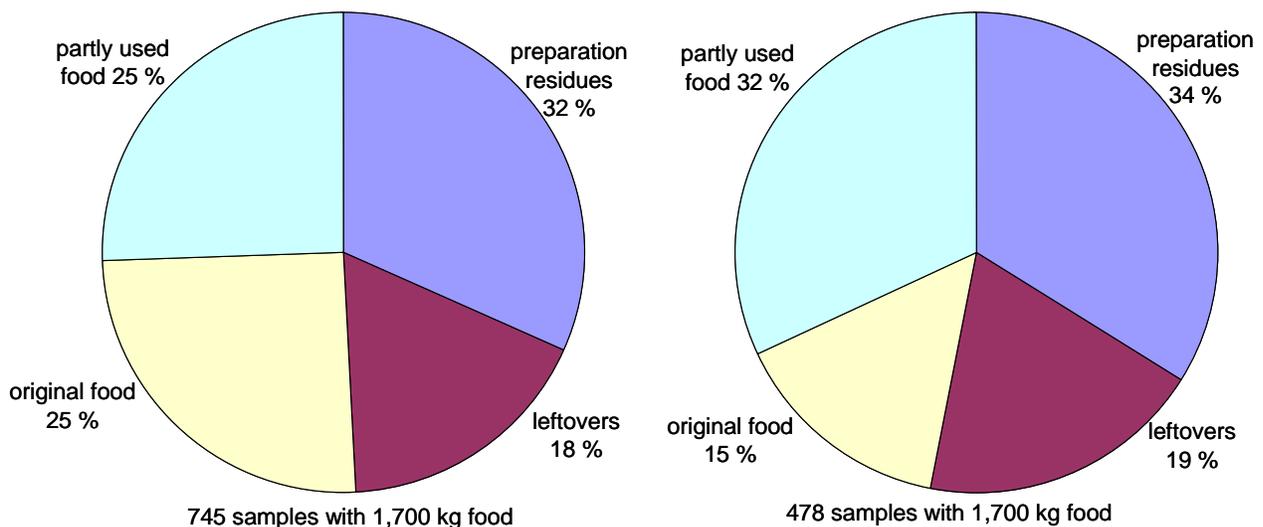


Figure 2. Comparison of two regions regarding composition of food waste within residual waste.

food waste as it is discussed in chapter 2.3. Important information which should be communicated is related to the “best before”, “use-by” and “expiration” date whereas only one-third of interviewed people can correctly interpret that specifications (Food Standard Agency 2006). In addition, measures such as using shopping lists, tables for rational portion sizes, hints for the use of food residues, calculation of wasted money due to wasted food items per person as well as general awareness training concerning food waste can be useful.

5. SUMMARY AND CONCLUSIONS

The wastage of food is a delicate topic due to several ethical controversies which are connected with social responsibility and values regarding society, environment and economy. One should keep in mind that facts such as over production and surplus is not only the single decision of a specific stakeholder of the life cycle of food but also a result of requirements and expectations of our society and the interaction of several economic and social developments. Thus, it is assumed that an effective sustainable shifting only can develop slowly within a long time period with the aid of the whole society.

The best prevention measure would be the foresighted planning of food production and distribution. As the correct prognosis of quantities of sales is very difficult for example due to unforeseeable or changing behaviour of the market or the consumer (e.g. shopping behaviour of consumer with secondary residence before the weekend), in spite of all planning there will be edible surpluses any way. Thus, the second best prevention measure is the use of those food items off the usual market. The implementation of this measure is covered by organisations such as food banks, food rescue programs or social supermarkets which collect edible food items and distribute them to people in need. On the household level prevention of food waste starts at the shopping behaviour where the consumer is influenced by strong incentives such as special offers and several psychological traps. As habitual behaviour is very insistent against changing efforts, prevention measures should have a long term perspective with a comprehensive and integrative approach. Unfortunately this requirement is not convenient to political decision makers and can not be used as showcase within a period of government.

As nobody intends to waste food from the first, various circumstances within the existing economic and social system lead to the wastage of edible food. The disposal of food and also other products which could still be used might also seen as a symbol of the value system of a society and cause ethical controversies. Thus, there is a long way to combat that insistent behaviour of wasting food at all level of our economic system.

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