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Domestic food waste, gap in times of crisis[1]

The purpose of this paper is to identify the main causes of food waste in the phase of domestic consumption, possible solutions and areas of interest, as well as to highlight the measures that consumers have already taken or to be put in place to counter models of unsustainable consumption. The survey involved a representative sample of 500 individuals. Data analysis was conducted in three steps: an analysis of simple correspondences, a cluster analysis and causal maps. Results show that only 26% of the participants recognized the need to give more attention to the problem of food waste. Particularly sensitive segments were younger, the better educated. Another interesting finding is that in times of economic crisis, afflicting Italy now for 8 years, attitudes, buying behavior and consumption of households have become more virtuous. Overall, the analysis confirmed the behavior of the participants, especially from Molise, still little careful. However, many respondents would be willing to accept advice on how to keep food and how to use the leftovers in the kitchen.

1. Introduction

This paper concerns the dynamics of food waste, a research field still globally little explored, in which different theoretical approaches and methodologies for quantitative analysis are used. However, authoritative data on food waste quantities and composition are fragmentary (Parfitt *et al.*, 2010; Langley *et al.*, 2010; Monier *et al.*, 2010) and systematic and comparable data are missing.

Most of both national and international research focuses on the formation of waste in the stages of production and distribution (Buzby and Hyman, 2012).

Some studies estimated that, globally, one third of the edible parts of food is lost or wasted each year (FAO, 2011; Barilla, 2012; FAO, 2013).

Poor marketing practices and consumer behaviour are recognised as the main source of waste coming from high-income countries. Consumers have been identified as the greatest contributors to food waste, more than food manufacturing, distribution, grocery retail and the hospitality sectors (Griffin *et al.*, 2009; Quested *et al.*, 2011).

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[1] This article is based on the paper presented at the 52nd SIDEA Annual Conference, Roma-Viterbo, 17th-19th September 2015.

In some specific stages of the chain, such as agriculture (Griffen *et al.*, 2009; WRAP, 2007) and production (Cabinet Office, 2008; C-Tech Innovation, 2004; Henningsson *et al.*, 2004; WRAP, 2007), as it is known, food waste seems inevitable. Most of it derives from an erroneous inventory management, from production surpluses, from damage or deformation. In these cases, corrective actions could be put in place.

Few recent studies (Schneider and Obersteiner, 2007; WRAP, 2008; Parfitt *et al.*, 2010) and pilot projects (Schneider and Lebersorger, 2009; Fanelli and Di Florio, 2013; Fanelli, 2015) have focused on food waste in the phase of domestic consumption, as well as campaigns such as the *Love Food Hate Waste* campaign, launched in Great Britain in November 2007 (WRAP, 2008) and the campaign *Less food wasted means more money in your wallet* in the Helsinki Metropolitan area, from 2005 to 2007 (YTV, 2008).

The most often quoted estimate is that 'as much as half of all food grown is lost or wasted before and after it reaches the consumer' (Lundqvist *et al.*, 2008).

A study from Waste and Resource Action Programme [WRAP] (2011a) estimated that households in the UK generate 7.2 million tonnes of food waste a year, most of which is thought to be avoidable, despite research suggesting that consumers have a distaste of wasted utility (Bolton and Alba, 2012). Furthermore, a previous study from the same source showed that households in the UK waste 6.7 million tonnes of food every year, around one third of the 21.7 million tonnes, and that consumers throw away 31% of the food that they buy (WRAP, 2008). Consumers waste food because it is left unused or too much cooked or prepared (WRAP, 2008). Precious land and resources that could otherwise be used to feed the poor are instead used up by developed world who is buying more food than what is going to be eaten. Moreover, the vast quantities of food that end up in landfills worldwide contribute significantly to the environmental impacts of waste, including greenhouse gas emissions.

Also the packaging affects waste, in two different ways. On the one hand, it has a positive impact on waste because it protects the products from damage and can help to extend the shelf life of some products. On the other hand, at some point, packaging will go to be wasted in the phase of domestic food, therefore excessive packaging is to be avoided.

But often the too large packages are one important cause for food waste: about 20-25% of the households' food waste could be related to packaging. Three aspects dominate the packaging related waste: packages that the consumer noted as being too big, packages that were difficult to empty, and wastage because of expired 'best before date' (Williams *et al.*, 2012).

A large part of the international literature mainly addresses the quantification of the value of wasted food (Buzby and Hyman, 2012; Parfitt *et al.*, 2010; Griffin *et al.*, 2009). In these works, in fact, the negative implications of this

phenomenon have been brought to light (Sonnino and McWilliam, 2011) without giving any possible strategies for its reduction.

Therefore, this paper aims at filling this gap by providing the results of a survey, carried out to quantify, qualify and identify the main causes of food waste as well as actions that consumers put in place to reduce or, even better, to prevent it.

The root causes of waste seem to vary according to the attitudes, eating habits and culture, and between developing and developed countries. In wealthy developed nations like Italy, food is wasted mostly at the consumption stage. There are several overlapping reasons for this. In highly developed countries, advanced technology in agriculture, as well as food processing and distribution, means that food is plentiful and cheap. Italy spends less of its income on food than most other countries in the world (20% compared to 43% in Egypt). Therefore, consumers do not appreciate the true value of food and buy more than they need without much thought. Additionally, they throw away old food that is still safe to eat, relying on 'best-by' labels which 'are generally not regulated and do not indicate food safety' according to the Natural Resources Defense Council (NRDC). Though there are other factors at work, low food prices are clearly connected to high food wastage. In an industrialized food system with low food prices, consumers often insist on extremely fresh, aesthetically perfect and abundant foods. Stores over-stock their shelves accordingly and then end up throwing out unbought foods.

2. Method

In this paper, we have used an online questionnaire to collect data. The information is filled out by a self-selected sample of 500 individuals who participated on a voluntary basis.

The questionnaire was spread from April 2014 to June 2014 through *Google Drive,* as well as through the social network *Facebook*.

The online questionnaire was designed to collect information related to the characteristics of the individual respondents, household size and composition, habits and attitudes of expenditure and food, directions and behaviors to reduce or prevent food waste in the phase of domestic consumption.

Data from the questionnaires and supplementary documentation have undergone an analysis of simple correspondences, a cluster analysis and causal maps. The first analysis allowed to identify why, how and how much is wasted; the second one divided respondents into three groups, each homogeneous and of different sizes; finally, causal maps were used to identify the main root causes of food waste in the phase of domestic consumption and the actions that the consumers take to reduce or prevent food waste.

The multivariate analysis was performed using the *R environment software* for the development of statistical analysis of data. It is considered a set of 8 variables. Data processing was carried out performing a cluster analysis. Euclidian distances were identified between point units and then it was decided to aggregate the respondents both with the hierarchical methods and using the single bond. From the resulting dendrogram, we identified and analysed individual clusters of respondents showing greater homogeneity (Fanelli and Pilati, 2003; Cerioli and Zani, 2007; Fanelli 2007; Fanelli and Felice, 2014).

The causal map, a particular type of cognitive map used to explore the cognitive structures of individuals (Huff, 1990; Fiol and Huff, 1992; Jenkins and Johnson, 1997; Scavarda *et al.*, 2006), has been used to perform the analysis of root causes. Causal relationships between elements of a system are represented by directed graphs where nodes signify ideas, concepts or problems, and unidirectional arcs connect the nodes indicating beliefs about the causal relationship between them (Scavarda *et al.*, 2006).

Causal map is a useful tool to improve quality, identify root causes, design information systems and develop strategy (Scavarda *et al.*, 2006).

The construction of a Current Reality Tree (CRT) starts with the identification of surface problems or undesirable effects (Walker and Cox, 2006). The CRT uses three types of symbols: nodes denote undesirable effects, arcs denote causal relationships and ovals represent the logical function 'AND', denoting that two or more causes are required to produce an effect. In the CRT, the undesirable effects are connected following an if–then logic and the logical relationships are tested following a systematic approach described in detail by Walker and Cox (2006). The result of this process is a graph, or tree, where the ultimate effects or problems are found at the top and, at the bottom, the root causes can be identified.

The analysis considers only products with shelf life, such as meat and fish, and fragile products, such as vegetables, bread, sweets and biscuits.As stated by Kantor *et al.* (1997), these products are the most thrown away.

3. Results

The questionnaire was completed in its entirety by 84% of respondents. The remaining 16% of survey participants did not answer some important questions such as habits and attitudes of expenditure and food, the income class of belonging and other important questions for the analysis.

The group of respondents represents the interests of young people very well. 66% of the sample is made up of women and the remaining 34% of men; the age group most represented by the survey is that one aged between 18 and

30 (70%), while it is poorly represented that one below 18 and above 61 years (less than 2%).

50% of those surveyed have a diploma, 32% a university degree, 13% have a middle school diploma and 5% have a master.

21% of respondents claimed to earn a monthly income of between € 1,201-1,600, 16% between € 801-1,200, 14% between € 2,801 and beyond.

The results of this research show that 87% of respondents shop in the supermarket, while 34% say that they have a vegetable garden or a garden. 33% go shopping once a week and 31% twice a week.

Among respondents, 34% does not have any favourite times to go shopping, whereas many others prefer to do their shopping in the early morning or mid-morning. 18% goes shopping early in the morning to buy the freshest products and during a less chaotic time of day, whereas 20% prefers to do shopping in mid-morning mainly for convenience, not giving importance to the freshness of the product.

The average household expenditure per week is between € 51-100; 45% of respondents said that spending affects their income at 21-50%.

60% of respondents consume first and second courses at lunch and dinner. The portions, for both lunch and dinner, are all average portions, almost never exceeding 200 g for each course.

Based on the answers given by the respondents, comparing food waste among the three periods, namely: pre-crisis period (before 2007), the crisis period (2007-2009) and post-crisis period (from 2009 onwards), the amount of food thrown away has changed slightly, maintained between 47-49%. In the period before the crisis, 16% said they threw away more food, a percentage that drops to 3% in the period of crisis and to 2% in the post-crisis period; while in the pre-crisis period, 4% claimed to throw away less food; that percentage rose to 17% during the crisis and 20% in the post-crisis.

Firstly, we considered the percentage of respondents by income class in order to quantify the value of domestic food waste for each class.

This is followed by the correlation between income and wasted products.

In the third stage, it is quantified, in terms of value, a weekly food waste.

Finally, an analysis of the main actions that the consumers carry out to reduce the domesticfood waste is made.

Figure 1 shows respondents divided into eight income groups and per each class, by dividing the percentage of respondents by income. The most represented share is the one ranging between € 1,201-1,600 (21%), followed by € 801-1,200 (16%). Poorly represented is the share ranging between € 2,401-2,800 (5%). While the share of € 2,801 is well-represented by 14% of the respondent class.
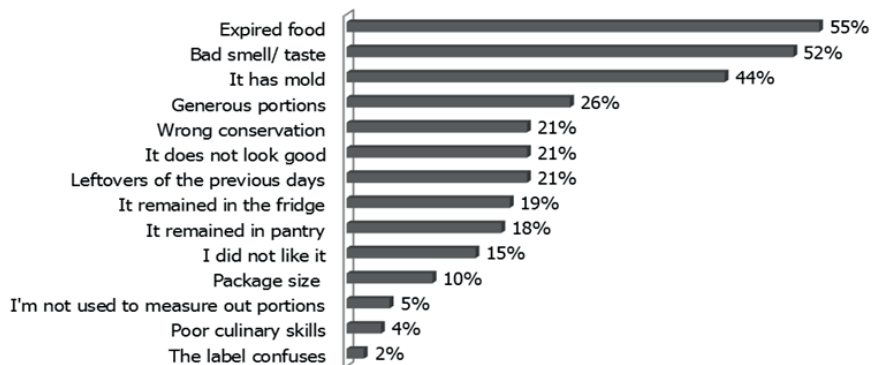
The correlation between income and wasted products is shown in Figure 2.

Fig. 1. Percentage of respondents by products more wasted
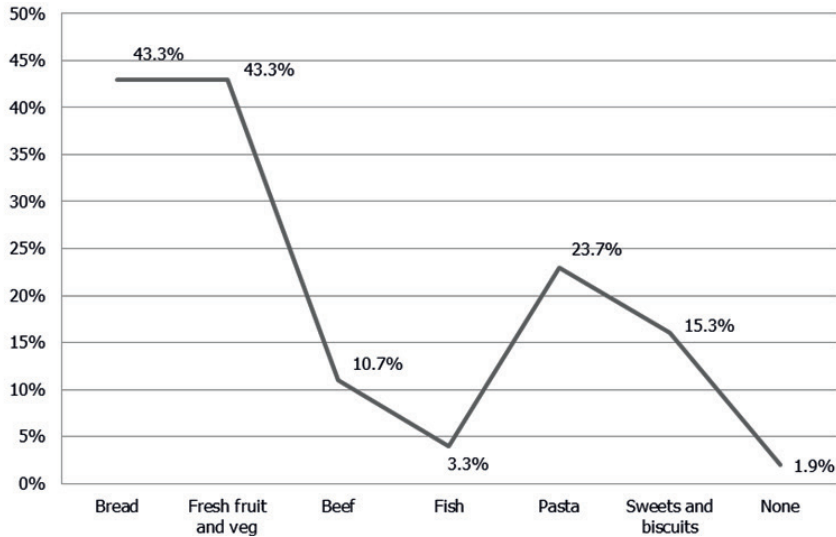
Source: Our processing of data collected with questionnaire

Fig. 2. Main root causes of domestic food waste

Source: Our processing of data collected with questionnaire

Results confirm that the income gap is an important determinant in terms of domestic food waste.

In fact, the same graph shows that the most wasted foods are meat, fruit and vegetables, making no distinction between income groups. Nonetheless,

the correlation between wastage and income groups reveals that those who throw away more food are the individuals of the wealthier classes.

With regard to the good intentions and actions, that respondents said they had undertaken and/or want to take in the future, the following emerged.

85% of those surveyed claimed to be aware of the environmental and economic value of food waste.

84% of respondents differentiate their waste and 65% of them said they had reduced the amount of compostable thrown away.

The actions that could reduce and/or minimize food waste according to respondents are:
-   Improving knowledge in the techniques of food preservation;
-   Cooking proper portions;
-   Spreading and buying single portions for students and/or for those who live alone;
-   Checking the expiration dates;
-   Organizing one's weekly balanced diet and purchasing, also using shopping lists.

The actions that respondents are implementing have nevertheless been grouped into the following categories:
1) Waste separation;
2) Actions to minimize or eliminate waste;
3) Get more information on the impact that waste has on the environment.

Another important element in the analysis of domestic food waste is the quantification, in value, of domestic food waste (Fig. 3).

Fig. 3. The destination of domestic food 'waste' based on percentage of respondents
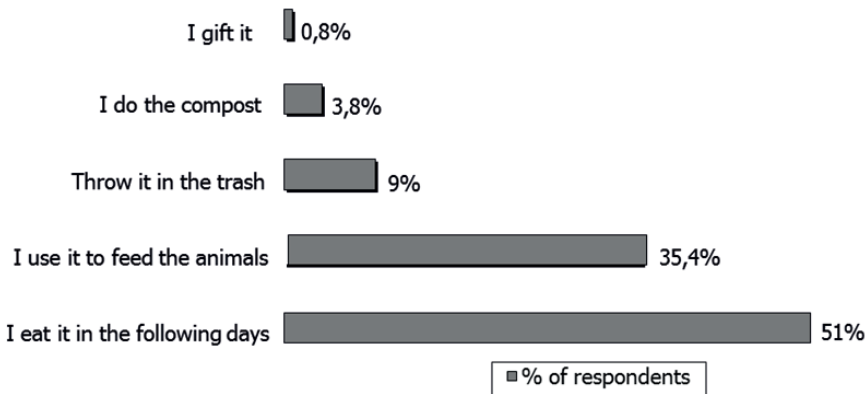
Source: Our processing of data collected with questionnaire

Respondents were asked to quantify their food waste on average per week, thus trying to monetize their waste, indicating one of the four identified groups. It may be noted that the majority (60.5%) indicates less than € 5, 17% is not able to quantify their waste per week, and only 5% of waste is thought to exceed € 21 per week.

Using causal maps (Fig. 4), it is possible to map the logic between causes and effects by creating a tree, where at the top we have the symptoms and at the bottom the root causes.

By analysing these maps, we can classify the root causes of waste into two groups:

- Natural constraints: factors that influence domestic food waste. These constraints are associated to the nature of the products (short or long shelf life) and to the package size.
- Consumer root causes: the characteristics of the consumer (income, age, profession) and poor culinary skills, such as cooking too much, not eating food in a timely manner, a lack of confidence in using to leftovers, incorrect conservation.

The first group can be influenced, in some ways, by marketing decisions and the commercial interest of the industry.

The second group is instead mainly related to consumer behavior, to the insufficient purchasing planning and to the best-before dates in combination with the careless attitude of those consumers who can afford to waste food.

Some main root causes have been identified (Fig. 4) by analysing the casual maps.

To the question 'How much food do you throw away?' 4% of respondents answered a lot, 70% little and 26% none.

These answers enabled us to identify three 'homogeneous' groups of consumers, the so called:

Cluster 1: The wasteful

This group includes only women, mostly female students, aged between 18-30 years, who claimed to have a monthly income between € 1,201-1,600, a monthly budget between € 151-200, spending between € 51-100 a week and wasting between € 6-20 weekly.

The cluster is not in the habit of weighing food and throws it away if expired.

Cluster 2: The careful

It is a mixed group consisting in many women and few men. Formed mostly by students, aged between 18-30, who claimed to have a monthly income between € 1,201-1,600, a monthly budget between € 101-150, spending between € 51-100 per week and wasting between € 0-5 weekly.

The cluster is not in the habit of weighing food; however, if it has expired, before throwing it away, it considers how long time has passed since the food has expired.

Fig. 4. Casual map of the main root causes of domestic food waste
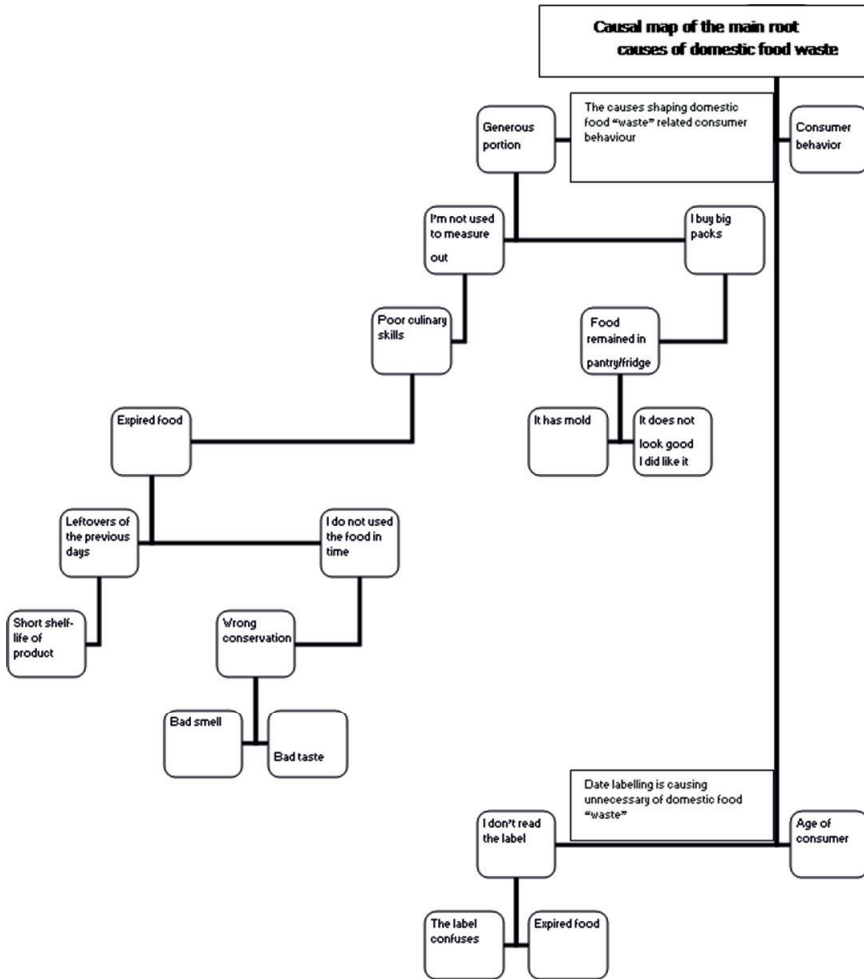
Source: Our processing of data collected with questionnaire

Cluster 3: The virtuous

The third and last group encompasses more women than men. Besides students, there are also the unemployed, aged between 18-30 years. They claimed to have a monthly income of between € 801-1,200, a monthly budget between € 101-150, spending between € 51-100 weekly and wasting between € 0-5 per week.

Fig. 5. Pre-Crisis (before 2007)
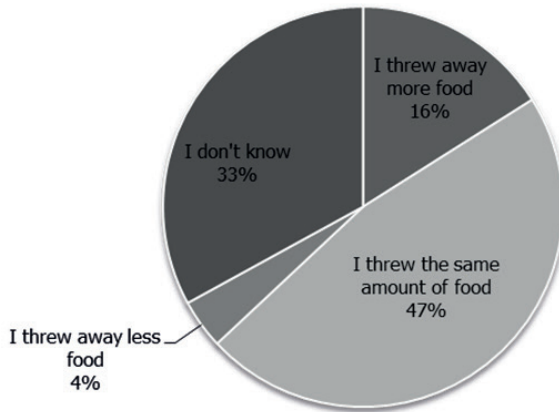
Source: Our processing of data collected with questionnaire

These respondents are not in the habit of weighing food, but even this cluster considers how long the food has expired before disposing of it. However, compared to the two previous clusters, a good percentage reported eating food even if expired.

Successively, it has been carried out an analysis of food waste during three periods: before, during and after the economic crisis (Fig. 5).

This analysis showed that the percentage of individuals who claimed to ignore how much food they throw away has remained more or less the same (33% in the period before the crisis, 32% and 29% respectively during the crisis and in the post-crisis period). The percentage of participants who said they throw away the same amount of food has remained almost unchanged (47% in the period before the crisis, 48% in the period during the crisis, and 49% in the post-crisis period).

There was a reduction, even in terms of percentages, which corresponds to the answer 'I threw away more food' (16% in the pre-crisis period, 3% in the period during the crisis, and 2% in the post-crisis period).

Conversely, the percentage of respondents who claimed to throw away less food has increased by 4% in the period before the crisis, by 17% in the period during the crisis, up to 20% in the post-crisis period.

4. Conclusions

The paper aims at exploring the problem of domestic food waste, with a focus on the main root causes and the actions that the consumers take to reduce waste.

The results revealed that the amount of food wasted has not been affected neither by the economic crisis nor by the increased attention to the environmental issues. In fact, the amount of food thrown away has changed slightly, maintained between 47-49%.

The issue of waste has been ignored for a long time and only recently has gained interest. Nevertheless, within the food system, waste affects all phases in the chain: production, processing, distribution and final consumption, in both singular and specific causes at every step.

Recently, several associations taking care of people in difficult economic conditions recover, when possible, the food discarded, thanks to the *Last Minute Market*, a spin-off of the University of Bologna, which has been running since 2003 for recovering food.

The causes of food waste are several: they depend on socio-economic status and culture, such as the bad habit of preparing more food than what can be eaten, leading to leftovers.

The study has clearly showed that each link in the food supply chain generates products in excess that cannot be sold. In addition to the negative externalities (for example pollution) for which all of society must, sooner or later, deal with, in many cases there could be not only the lacking respect of the original destination of the product, i.e. human food, but also a higher or lower cost (transportation, processing, storage and disposal), depending on the particular product, which the company must in any case support.

The rapid processes of biological deterioration of food make arduous to quantify waste. Even if data regarding waste were available, it would not be, and could not be, in the public domain.

The survey conducted on a representative sample of 500 individuals, 68.4% of whom reside in Molise, has highlighted their attitudes and behaviour in relation to food waste at home. Only 26% of respondents - among whom especially younger, better educated and residents in Molise - recognized the need to pay more attention to this problem.

However, many respondents would be willing to accept advice on how to keep food and how to use leftovers in the kitchen. At the same time, they reported the recurring difficulty to interpret the information on the labels of the products purchased. Perhaps, this could be the main reason for which the food that is not considered good is thrown away.

Another interesting finding is that in times of economic crisis, which has afflicted Italy in the last 8 years, attitudes, buying behaviours and household consumption have become more virtuous.

The authors acknowledge that the research has some limitations in relation to the fact that the analysis was restricted to some regions and to a limited group of consumers. Nevertheless, on the basis of a qualitative approach, the

identification of root causes of domestic food waste has been possible only using relatively small samples. Future studies will concern other geographical regions and expand the sample in order to generalize the results.

References

Barilla, Center for Food and Nutrition (2012). *Lo spreco alimentare, cause, impatto e proposte*. Roma. Available at: http://www.nonspreco.it/wp-content/uploads/2013/10/Lo-spreco-alimentare-Barilla-Center.pdf (last visited, 12 April 2016).

Bolton L.E., Alba J.W. (2012). When less is more: Consumer aversion to unused utility. *Journal of Consumer Psycology*, 22(3): 369-383. DOI: 10.1016/j.jcps.2011.09.002.

Buzby J.C., Hyman J. (2012). Total and per capita value of food loss in the United States. *Food Policy*, 37(5): 561-570. DOI: 10.1016/j.foodpol.2012.06.002

Cabinet Office (2008). *An analysis of the issues*. Revision D – August 2008. Cabinet Office, Strategy Unit, London, UK. Available at: http://webarchive.nationalarchives.gov.uk/+/http://www.cabinetoffice.gov.uk/media/cabinetoffice/strategy/assets/food/food_analysis.pdf. (last visited, 11 April 2016)

Cerioli A., Zani S. (2007). *Analisi dei dati e data mining per le decisioni aziendali*. Milano: Giuffrè Editore.

Commission Regulation (EC) No 1221/2008 of 5 December 2008 amending Regulation (EC) No 1580/2007 laying down implementing rules of Council Regulations (EC) No 2200/96, (EC) No 2201/96 and (EC) No 1182/2007 in the fruit and vegetable sector as regards marketing standards. Available at: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2008:336:0001:0080:en:PDF> (last visited, 15 April 2016).

C-Tech Innovation (2004). *United Kingdom food and drink processing mass balance.* Biffaward programme on sustainable resource use, Loughborough. Available at: http://www.ecolateral.org/MassBalanceSymphonySectors [last visited, 5 February 2010].

Directive 2000/13/EC of the European Parliament and of the Council of 20 March 2000 on the approximation of the laws of the Member States relating to the labelling, presentation and advertising of foodstuffs. Available at: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2000:109:0029:0042:EN:PDF> (last visited, 11 April 2016).

Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives. Available at: <http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32008L0098&from=LV> (last visited, 15 April, 2016).

EU Food Policy (2012). Member states to debate legal status when "best before" date is exceeded. *EU Food Policy*, 97: 8.

EUFIC (2011). EUFIC Forum n° 5 – Consumer response to portion information on food and drink packaging – A pan-European study. Brussels, Belgium. Available at: <http://www.eufic.org/article/en/expid/forum5-Consumer-response-portion-information-food-drink-packaging/> (last visited, 10 March 2010).

European Commission (2010). *Preparatory study on food waste across EU 27*. Bruxelles, Belgium. Available at: <http://ec.europa.eu/environment/eussd/pdf/bio_foodwaste_report.pdf> (last visited, 9 February 2016).

European Parliament (2012). Resolution of 19 January 2012 on how to avoid food wastage: strategies for a more efficient food chain in the EU. Bruxelles, Belgium. Available at:

<http://www.europarl.europa.eu/sides/getDoc.do?pubRef=-//EP//NONSGML+TA+P7-TA-2012-0014+0+DOC+PDF+V0//EN>.

Fanelli R. M., Pilati L. (2003). Similarità e convergenza dei consumi alimentari in Italia. Un'analisi a livello regionale (1973-1997). *Rivista di Economia Agraria*, LVIII(1): 3-46.

Fanelli R. M. (2007). Quali funzioni per quanti e quali contesti agricoli territoriali "omogenei"?. *Rivista di Economia & Diritto Agro-Alimentare*, 2: 127-167.

Fanelli R.M., Di Florio A. (2013). Lo spreco alimentare nella fase del consumo domestico. *Rivista di Agricoltura Istituzioni Mercati*, 3: 33-50. DOI: 10.3280/AIM2013-003003.

Fanelli R.M., Felice F. (2014). Un'applicazione dell'analisi multivariata e della convergenza non parametrica all'industria birraria italiana. *Rivista di Economia Agraria*, 69(1): 7-30. DOI: 10.13128/REA-16305.

Fanelli R.M. (2015): Food waste in the phase of domestic consumption: the causes and preventive actions, Paper presentato alla 52° SIDEA Conference: *The value of food, internationalization, competition and local development in agro-food system*, Viterbo 17-18 settembre 2015.

Fiol C.M., Huff A.S. (1992). Map for managers: Where are we? Where do we go from here? *Journal of Management Studies*, 29(3): 267-285. DOI: 10.1111/j.1467-6486.1992.tb00665.x

FAO - Food and Agriculture Organization (2011). *Global food losses and food waste - Extent, causes and prevention*. Rome, Italy. Available at: <http://www.fao.org/fileadmin/user_upload/ags/publications/GFL_web.pdf> (last visited, 11 March 2016).

FAO - Food and Agriculture Organization (2013). *Food wastage footprint - Full costs accounting*. Final report. Available at: <http://www.fao.org/3/a-i3991e.pdf> (last visited, 18 March 2016).

Food Safety Authority of Ireland (2011). 5 out of 10 People Ignore Use by Dates. News, 17 November 2011. Available at: <http://www.fsai.ie/news_centre/press_releases/5_out_of_10_People_Ignore_Use_By_Dates/17112011.html> (last visited, 9 March 2016.

Griffin M., Sobal J., Lyson T.A. (2009). An analysis of a community food waste stream. *Agriculture and Human Values*, 26(1-2): 67-81. DOI: 10.1007/s10460-008-9178-1

Henningsson S., Hyde K., Smith A., Campbell M. (2004). The value of resource efficiency in the food industry: a waste minimisation project in East Anglia, UK. *Journal of Cleaner Production*, 12(5): 505–512. DOI: 10.1016/S0959-6526(03)00104-5

Huff A.S. (ed.) (1990). *Mapping Strategic Thought*. Chichester, England: John Wiley & Sons Ltd.

Jenkins M., Johnson G. (1997). Linking Managerial Cognition and Organizational Performance: A Preliminary Investigation Using Causal Maps. *British Journal of Management*, 8: 77-90.

Kantor L.S., Lipton K., Manchester A., Oliveria V. (1997). Estimating and Addressing America's Food Losses. *FoodReview*, 20(1) (Jan.-Apr.): 2-12.

Langley J., Yoxall A., Heppell G., Rodriguez E.M., Bradbury S., Lewis R., Luxmoore J., Hodzic A., Rowson J. (2010). Food for Thought? – A UK pilot study testing a methodology for compositional domestic food waste analysis. *Waste Management & Research*, 28(3): 220-227. DOI: 10.1177/0734242X09103837

Lundqvist J., de Fraiture C., Molden D. (2008). *Saving Water: From Field to Fork —Curbing Losses and Wastage in the Food Chain*. SIWI Policy Brief. Stockholm, Sweden: SIWI.

Monier V., Mudgal S., Escalon V., O'Connor C., Gibon T., Anderson G., Montoux H., Reisinger H., Dolley P., Ogilvie S., Morton G. (2010). *Preparatory study on food waste across the EU 27*. Final report. European Commission (DG ENV) Directorate C-Industry, Contract #: 07.0307/2009/540024/SER/G4.

Parfitt J., Barthel M., Macnaughton S. (2010). Food waste within food supply chains: quanti-fication and potential for change to 2050. *Philosophical Transactions of the Royal Society B*, 365(1554): 3065-3081. DOI: 10.1098/rstb.2010.0126 Project on behalf of Federal State Government of Upper Austria, Vienna. Sustainable Restaurant Association: <http://www.toogood-towaste.co.uk/>.

Potočnik J. (2011). *It's time to stop wasting food.* Conference "Combating food waste in the EU", Bruxelles, 8th November 2011 (Ref: SPEECH/11/725). Available at: <http://europa.eu/rapid/pressReleasesAction.do?reference=SPEECH/11/725&format=HTML&aged=0&language=EN> (last visited, 10 March 2016).

Quested T.E., Parry A.D., Easteal S., Swannel R. (2011). Food and drink waste from households in the UK. *Nutrition Bulletin*, 36(4): 460-467. DOI: 10.1111/j.1467-3010.2011.01924.x

Regulation (EU) No 1169/2011 of the European Parliament and of the Council of 25 October 2011 on the provision of food information to consumers, amending Regulations (EC) No 1924/2006 and (EC) No 1925/2006 of the European Parliament and of the Council, and repealing Commission Directive 87/250/EEC, Council Directive 90/496/EEC, Commission Directive 1999/10/EC, Directive 2000/13/EC of the European Parliament and of the Council, Commission Directives 2002/67/EC and 2008/5/EC and Commission Regulation (EC) No 608/2004. Available at: <http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32011R1169&from=EN>.

Scavarda A.J., Bouzdin-Chameeva T., Goldstein S.M., Hays J.H., Hill A.V. (2006*).* A Metho-dology for Constructing Collective Causal Maps. *Decision Sciences*, 37(2): 263-283. DOI: 10.1111/j.1540-5915.2006.00124.x

Schneider F., Lebersorger S. (2009). *Untersuchung der Lebensmittel im Restmüll in einer oberö-sterreichischen Region* (Analysis of food waste in residual waste in an Upper Austrian re-gion). Institut für Abfallwirtschaft, Department für Wasser, Atmosphäre und Umwelt der Universität für Bodenkultur Wien (ABF-BOKU), im Auftrag von Amt der Oö. Landesre-gierung, Direktion Umwelt- und Wasserwirtschaft, Abteilung Umweltschutz, Linz.

Schneider F., Obersteiner G. (2007). Food waste in residual waste of households – regional and socio-economic differences. In: Cossu R., Diaz L.F., Stegmann R. (eds), Proceedings Sardinia 2007, Eleventh International Waste Management and Landfill Symposium, S. Margherita di Pula, Cagliari, Italy, 1-5 October 2007 (Abstract; full paper on CD), pp.469-470.

Sonnino R., McWilliam S. (2011). Food waste, catering practices and public procurement: A case study of hospital food systems in Wales. *Food Policy*, 36(6): 823-829. DOI: 10.1016/j.foodpol.2011.09.003.

Walker E.D. II, Cox J.F. III (2006). Addressing ill-structured problems using Glodratt's thin-king processes: a white collar example. *Management Decision*, 44(1): 137-154. DOI: <http://dx.doi.org/10.1108/00251740610641517>

Williams H., Wikström F., Otterbring T., Löfgren M., Gustafsson A. (2012). Reasons for hou-sehold food waste with special attention to packaging. *Journal of Cleaner Production*, 24: 141-148. DOI:10.1016/j.jclepro.2011.11.044

WRAP (2007). *Food storage and packaging*. Retail Programme - Food Waste: Final Report. Banbury, UK. Available at: <http://www.wrap.org.uk/content/food-storage-and-packa-ging> (last visited, 5 April 2016).

WRAP (2008). *The food we waste*. Food waste report. Banbury, UK. Available at: <http://www.ifr.ac.uk/waste/Reports/WRAP%20The%20Food%20We%20Waste.pdf> (last visited, 11 April 2016).

WRAP (2010). Press release: Industry recommendations unveiled to reduce household food waste, 19 August.

WRAP (2011a). *Consumer insight: date labels and storage guidance*. Banbury, UK. Available at: <http://www.wrap.org.uk/sites/files/wrap/Technical%20report%20dates.pdf> (last visited, 11 April 2016).

WRAP (2011b). WRAP reports significant progress on waste reduction. 15th November 2011. Available at: <http://www.wrap.org.uk/content/wrap-reports-significant-progress-waste-reduction> (last visited, 12 April 2016). about food waste: http://www.lovefoodhatewaste.com/about_food_waste>.

YTV Waste management, (2004-08): Web Pages about Waste Prevention,http://www.ytv.fi/fiksu (last visited, 16 April 2016).