

Food Wastage Management: The “Una Buona Occasione – A Good Opportunity” Contribution

Erica VARESE¹, Alessandro BONADONNA²

¹Assistant Professor, Department of Management, University of Turin, Italy; E-mail: erica.varese@unito.it

²Assistant Professor, Department of Management and NatRisk – Research Centre on Natural Risks in Mountain and Hilly Environments, University of Turin, Italy; E-mail: alessandro.bonadonna@unito.it

Abstract

Food waste is a global problem involving all supply chain stages. This phenomenon is on the increase and leads to negative economic, environmental and social issues. Numerous underlying factors may contribute to increasing the production of food waste. There are technical factors such as food perishability, food safety, storage and preservation; deterioration of the product or its packaging; spatial and temporal factors e.g. transport and transformation; consumers' choice of flavours, preferences and food consumption habits. The economic factors include waste collecting and recycling costs. However, lost foodstuff and waste can be limited with the implementation of a correct management approach.

In this context, the Piedmont and Valle d'Aosta Regions (North West Italy) have been involved in setting up the project “Una buona occasione” (“A good opportunity”). This initiative aims at promoting consumer awareness through a variety of tools i.e. a new design for rural economy to eliminate surplus production and, when necessary, the reuse of this surplus. Hopefully, all these activities will lead to a better management of the crucial relationship between production and distribution operators, which includes education on food consumption in order to reduce waste in food services.

Keywords: food wastage; “Una buona occasione” project; Piedmont and Valle d'Aosta; food waste reduction.

1. Introduction

The phenomenon of food wastage is a global problem, showing a dimensionally increasing trend. Data provided by FAO (Gustavsson et al., 2011) indicate that one third of the food produced globally every year, about 1.3 billion tons, goes lost or is wasted along the food chain. In medium-high income countries, food waste mostly takes place at the end of the food chain, i.e. at the time of sale and/or consumption, while in low income countries it mainly occurs during the first phases of the food chain. The quantity of food scrap observed at consumer level in more advanced countries is 222 million tons, which amounts to nearly the total net foodstuff production of sub-Saharan Africa, adding up to 230 million tons. Pro-capita garbage generated by consumers amounts to 95-115 kg/year in Europe and North America and to 6-11 kg/year in sub-Saharan Africa and in South/South-East Asia. Wastage along the chain in Europe and North America amounts to 280-300 kg/year, in Africa and in South/South-East Asia to 120-170 kg/year. Other estimates suggest that the quantity of unused food might add up to 1.6 billion tons of primary produce (EU, 2014) or even to 2 billion tons, ending up in garbage for reasons connected with inefficiencies in the process of production and moving up to the final consumption phase (Lundqvist, 2009; IME, 2013).

In the EU (EU, 2012) in 2011 food scrap observed in the 27 Member States amounted to 89 million tons a year, about 179 kg per capita. These figures do not take into consideration losses in agricultural production or fish dropped back into the

sea. The responsibility for these wastes can be ascribed for 42% to families (of which, 60% is unavoidable), 39% to producers, 14% to the catering industry and 5% to retailers. If nothing is done, waste might increase by 40%, reaching the amount of 126 million tons. Produced and not consumed food takes up nearly 1.4 billion hectares of agricultural land, which is 30% of the world agricultural surface (EU, 2014).

Wastage volumes in the early parts of the chain, including production, post-harvest management and storing, add up to 54%; those in the final parts, with transforming, distribution and consumption phases, are the remaining 46%. Agricultural production weighs on the total volume of food wastage by 33% (FAO). Losses in the early parts are rather homogeneous in the various geographic areas, covering about one third of total wastage, while downstream we can observe larger differences. In societies with a higher average income, waste in the final parts covers 31-39% and is determined by consumer behaviour or by excessively strict supply chain quality standards. Losses in the final parts are lower for developing countries, only about 4-16%. In these countries waste is observed significantly in post-harvest phases, being caused by financial, structural, storage and transport obstacles. In this context, the need to analyze the phenomenon properly is evident; the scope is to find out and plan suitable strategies in order to contain its expansion and gradually reduce it. The “Una Buona Occasione” (“A Good Opportunity”) project, resulting from joint efforts among bodies operating in Piedmont and in the Aosta Valley respectively, is embedded into this context and pursues the aim of filling some

gaps with a view to a reduction of the problem. Particularly, the main issue discussed is the one related to designing a strategy and its instruments in order to stimulate better understanding of this phenomenon.

This research is organized as follows:

Section 2 presents a literature review and the related concepts of food waste and similar ones.

Section 3 describes European and Italian initiatives to fight the food waste phenomenon.

Section 4 indicates a six-phase model defining the implementation process of the “Una Buona Occasione” project.

Section 5 presents the “Una Buona Occasione” case.

Finally, the last paragraph mentions implications and limitations of this study and identifies topics for future research.

2. Literature review

According to the European Union, “*food wastage*” is generally understood to mean «*all the foodstuffs discarded from the food supply chain for economic or aesthetic reasons or owing to the nearness of the ‘use by’ date, but which are still perfectly edible and fit for human consumption and, in the absence of any alternative use, are ultimately eliminated and disposed of, generating negative externalities from an environmental point of view, economic costs and a loss of revenue for businesses*» (EU, 2012).

Given the definition of wastage in the EU, it is however possible to draw a further distinction between “*food losses*” and “*food waste*”, meaning by these terms respectively food losses «*happening in the phases of agricultural production, after-harvest and foodstuff transformation and processing*» and food waste «*referring to the final part of the food chain, and therefore to the phases of sale and consumption*», highlighting that by “*food wastage*” one can mean “*food losses and food waste together*” (Parfitt et al., 2010; Gustavsson et al., 2011; FAO, 2014¹). According to Segrè and Falasconi (2011) the expression “*food wastage*” indicates «*products perfectly fit for use, but which for the most various reasons may not be sold any more, and which, in the absence of any alternative use, are ultimately eliminated and disposed of*».

WRAP (2009) suggests a possible classification of food losses according to the possibility of avoiding them, making a distinction between *avoidable* i.e. foodstuff which is still fit for human consumption, *potentially avoidable* i.e. food consumed only by some people or food requiring particular treatment to become consumable, and *unavoidable* i.e. part of food which is not fit for human consumption.

Slow Food offers a definition of a qualitative nature, pointing out that food wastage is «*the result of the lack in value bestowed upon food production and upon food itself across all the various phases of the agricultural- and food chain*» (Hudson and Messa, 2014). Indeed, food wastage starts in a phase even preceding primary agricultural production, because the quantity of food products obtained in the present economic system is organized according to commercial agreements which do not always encounter the real needs of demand (Stuart, 2009).

But wastage can also be understood as «*food products discarded from the agro-food chain, which have lost commercial value, but which are still fit for human consumption*» (Barilla, 2012) because they keep their food quality requirements unaltered (Peri, 2006). In industrialized countries, according to Smil (2004), food wastage can appear as excessive nutrition of individuals, i.e. the difference between how much a person consumes and how much (less), in reality, a person should consume.

The genesis of food wastage involves all those who, in different ways, take part in the production, transformation, mani-

pulation, distribution and consumption of food products, and more generally in the food chain (Eriksson et al., 2012; Nahman et al., 2012; Verghese et al., 2013; Lebersorger and Schneider, 2014; Fiore et al., 2015; Jörisen et al., 2015; Cicatiello et al., 2016; Mondéjar-Jiménez et al., 2016; Beausang et al., 2017; Eriksson and Spångberg, 2017; Calabrò and Vieri, 2017; Lanfranchi et al., 2018; Peira et al., 2018; Porat et al., 2018). It is made up of various processes, and Gustavsson et al. (2001) suggest a chain in five steps: agricultural production, post-harvest management and storage, processing, distribution and consumption.

On the one hand, causes leading to wastage are various: damage from parasites and sicknesses, adverse meteorological conditions, lack of conformity with quality specifications (primary production); lack of conformity with quality and/or aesthetical specifications, damage from parasites, losses from manipulation and biological degradation (post-harvest management and storage); scraps and residues from food processing, inefficient production line, wrong batches, inadequate remaining duration (processing and packaging); damage during transport/storage, product deterioration, inadequate remaining duration in the distribution phase, residues from food processing, bad stock management, improper foodstuff manipulation, foodstuff deterioration, excessive quantity of food being prepared, confusion on expiry date and minimum durability date in catering and home consumption (Pierson et al., 1982; Buzby et al., 2014; Newsome et al., 2014; Göbel et al., 2015; Franchetti, 2016; Amato and Musella, 2017; Canali et al., 2017; De Hooge et al., 2017; Hermsdorf et al., 2017; Lanfranchi and Giannetto, 2017; Wilson et al., 2017; Rivero et al., 2017; European Commission, 2018). On the other hand, some solutions are identified and implemented e.g. initiatives dedicated to the integration of circular economy concept (McDonough and Braungart, 2002; Ellen MacArthur Foundation, 2013; Barba and Díaz-Ruiz, 2015; Scuderi et al., 2015; Borello et al., 2016; Jurgilevich et al., 2016; Andreopoulou, 2017; Borrello et al., 2017; Geissdoerfer et al., 2017; Cantino et al., 2017).

3. The European and Italian initiatives

As stated by the European Commission (EU, 2014), food wastage might increase by 40% by the year 2020, reaching the amount of 126 million tons including avoidable and unavoidable wastage, if a prevention policy is not enacted. Among proposals brought forth to reduce waste there are first of all some sensitization campaigns aimed at informing the public on how to avoid wastage. On top of this, the European Union published 10 tips to reduce food waste, save money and protect the environment. According to this document, the advice is to organize shopping by planning a weekly menu, to check food durability (best before date) and know the difference between the wordings “use by” and “best before date”, to consider one’s budget because wasting food means wasting money, to care for fridge maintenance checking seals and temperature, to take instructions on food preservation into account and try to rotate foodstuffs positioning those with longer durability (Marklinder and Eriksson, 2015). The document further advises to serve small amounts of food and to recycle leftovers for new meals or transform food residues into compost. Finally, it suggests freezing food in order to have it ready when one does not have much time (European Commission, 2018).

A few tools for more transparency as to distribution and catering have also been proposed. More specifically, on the distribution level the introduction of a labelling system with double date marking has been suggested, foreseeing a commercial date marking to indicate the date by which the product

¹ FAO. *Definitional framework of food loss*, 2014. Available online http://www.fao.org/fileadmin/user_upload/savefood/PDF/FLW_Definition_and_Scope_2014.pdf (accessed on 26 March 2018).

FOOD SAFETY MANAGEMENT

may be sold, and a further date marking indicating by when the product should be consumed, as well as the possibility of selling products discounted when close to their expiry date. Furthermore, the opportunity of producing packaging with various net quantities has been taken into consideration, in order to help consumers purchase the needed quantity.

In Italy, the initiative which in its own right can be defined as the one coordinating activities directed at fighting food waste is the "Piano Nazionale di Prevenzione degli Sprechi Alimentari (PINPAS)" ("National Plan for Food Waste Prevention"). In June 2014 the Environment Ministry, with organizational coordination by Last Minute Market, promoted the First Board for PINPAS Articulation (MINIAMBIENTE), which was joined by all operators acting within the agro-food chain in any way i.e. firms, producer and consumer associations, industry organizations, as well as FAO and Expo. The meeting brought several aspects into

evidence, which led to defining 10 priority measures, i.e. 1. Education and formation. 2. Communication, sensitization and sharing. 3. Documentation and data. 4. Research and legal interventions. 5. Donations and devolutions. 6. Purchases (*Green Public Procurement*). 7. Voluntary agreements. 8. Transformation. 9. Enterprise social responsibility. 10. Social innovation (PINPAS, 2014).

European and Italian initiatives aiming at reducing and/or eliminating food waste are numerous. Based on the chosen philosophy and the identified strategy, it is possible to focus on some common characteristics leading to a possible classification of initiatives implemented up to now (Table 1). It is thus possible to underline how the leading aspects in the majority of initiatives concern using the unsold (avoidable waste), collaboration with FSOs (Food System Operators) and sensitization on food waste.

	PECULIARITIES						
	EQUAL ACCESS TO FOOD RESOURCES	USING THE UNSOLD (avoidable waste)	SOCIAL INCLUSION	COLLABORATION WITH FSOs	DIVULGATION OF AGRICULTURAL AND SOCIAL RESPONSIBILITY	SENSITIZATION FOOD WASTE	VOLUNTARY ACTIVITY
EUROPEAN INITIATIVES							
▪ ANDES	✓	✓	✓	✓	✓		
▪ FOOD CYCLE	✓	✓	✓	✓	✓		✓
▪ SWF				✓	✓	✓	
▪ WRAP				✓	✓	✓	
▪ FARESHARE	✓	✓		✓	✓	✓	✓
ITALIAN INITIATIVES							
▪ BANCO ALIMENTARE	✓			✓			✓
▪ LMM		✓		✓		✓	
▪ BUON SAMARITANO		✓		✓		✓	
▪ BUON FINE		✓		✓		✓	✓
▪ LMSC	✓			✓			
▪ IL BUONO CHE AVANZA		✓		✓		✓	✓
▪ BUTA STUPA - PORTAMI VIA		✓		✓		✓	
▪ FA BENE	✓	✓	✓	✓			✓

Table 1. European and Italian initiatives concerning food waste

Source: own processing on information websites dedicated to the food waste initiatives

Below follows a brief description of the initiatives in Europe and in Italy taken into consideration, which have as their main objective waste relocation and relocation of the unsold.

Main European Initiatives

Association Nationale de Développement des Épiceries Solidaires (ANDES) i.e. *National Association for the Development of Ethical Groceries*, is an association gathering ethical groceries operating in France. ANDES was set up with the aim of enabling economically disadvantaged people to have access to quality foodstuffs, on the one hand, and to suggest activities based on users' competences, on the other, in order to reconstruct persons up to their social rehabilitation.

The *FoodCycle* association started in the United Kingdom in 2008, inspired by the U.S. project "*The Campus Kitchens Project*". This association's main objectives concern reducing food scarcity by providing nutritious meals to the more vulnerable social groups; reducing food waste by recuperating the unsold; creating communities capable of remarkably reducing the phenomenon of social isolation by organizing common meals; forming volunteers able to develop compe-

tences and support positive social change in their community.

Stop Wasting Food (SWF) is the most important Danish consumer movement against food waste and actively cooperates with the European Union and the United Nations. Its objective is sensitization of the public opinion on issues concerning environment and food waste. Specifically, it organizes information campaigns and events, mobilises press and media, stimulates discussion with the final aim of significantly reducing the quantity of food waste (Juul, 2015).

Waste & Resources Action Programme (WRAP) is a charity founded in the year 2000, operating in the United Kingdom (England, Scotland, Wales and Northern Ireland) with the scope of supporting waste reduction, the development of sustainable products and, more in general, efficient resource management. WRAP promotes consumer campaigns and operates in synergy with food and packaging producers, distributors, public administrations, touristic and hotel operators, in order to promote food waste reduction (Quested et al., 2013).

Fareshare is a British charity focused on redistribution of food surplus to charitable bodies, with the intent to reduce the phenomenon of hunger in the United Kingdom. Fareshare

collects supermarket surpluses, still packed and labelled, and even refrigerated, as long as they have not surpassed the date appearing on the packaging (Caplan, 2017).

Main Italian Initiatives

Banco Alimentare i.e. *Food Bank*, is a foundation established in 1989 with the main objective of collecting surplus in the various phases of the agro-food chain and foodstuffs in the large-scale retail trade and in subsequent redistribution. This virtuous behaviour enables to obtain social benefits, free assignment of unsold foodstuffs to institutions caring for needy people, economic benefits, a reduction in waste disposal and a contribution to the community in natural terms, environmental benefits, reduction in the quantity of waste which can potentially be a source of pollution (Vittuari et al., 2017; Foti et al., 2018).

The initiative *Last Minute Market (LMM)* started in 1998 from a spin-off of Bologna University. The Last Minute Market project consists in connecting and coordinating those who are interested in foodstuff exchange (firms, institutions, third sector, citizens), making it possible for any unsold or untradeable good to be recuperated. Furthermore, LMM has activated numerous collateral activities, such as the multi-year campaign “A year against waste”, aimed at sensitizing the public opinion on causes and consequences of wastage and on ways to reduce it (Vittuari et al., 2017).

In 2005 the Turin Municipality started the *Buon Samaritano* project i.e. *Good Samaritan*, which involves AMIAT i.e. Multiservice Environmental Hygiene Firm Turin, several schools in the Turin area and some welfare bodies. The project pursues the objectives of reducing wastage of food and organic waste and involving the support of local welfare bodies and charities. The initiative was inspired by National Law nr. 155/2003, called of the “good Samaritan”. This Law enables to collect some foodstuffs (bread and fruit) which were not consumed in school meals and address them to canteens run by welfare bodies and charities in the Turin area.

Within the numerous solidarity activities set up by Coop, the *Buon Fine* project i.e. *good purpose or ugly but good or useful waste*, is designed to recuperate and use to purposes of solidarity foodstuffs which cannot be traded any more (for example, crushed packaging), while keeping all their hygienic and nutritional characteristics unaltered. These products are given for free to voluntary associations which provide in several ways for distributing them to underprivileged and needy people.

Last Minute Sotto Casa (LMSC) i.e. *Last Minute Corner-shop*, is an initiative in the Turin area aiming at reducing surplus in food products; it is directed mainly at proximity shops and consequently at customers living in the area. The site managers offer an online system which enables to connect shop-owners and potential customers. The project makes it possible to put on the market products which are still fresh but need to be consumed soon (for example bakery goods, fresh confectionery) to the benefit both of shop-keepers, who reduce the unsold, and customers, who can purchase fresh products at a convenient price.

The project *Il buono che Avanza* i.e. *Good things left over*, is an activity promoted by the Milan voluntary association *Cena dell'Amicizia Onlus*, which has for a long time been contrasting food wastage by promoting a sustainable lifestyle and sensitizing as to the problem of homeless people. The objective is to create a network of food-selling businesses (restaurants, canteens, bistros, catering etc.) offering the possibility of taking home left over food and/or drinks (*doggy bag*).

Buta stupa i.e. in Piedmontese language literally “*corked bottle of precious wine*”, was established in Piedmont in the year 2000 with the scope of reducing wine wastage in catering by offering consumers an additional service enabling them to take home wine bottles which have not been emptied. A similar initiative is proposed by the Italian Association of Sommeliers (AIS) since 2011 with the *Portami via (Take me away)* project.

This initiative foresees that all participating businesses are given *wine bags* in order to enable clients to carry not completely consumed wine bottles home.

Finally, the *Fa bene (It's healthy)* project is a system action activated in 2016 with the objective of recuperating in local markets food surpluses which have not been sold by traders as well as spontaneous donations by buyers, and to manage their redistribution to economically disadvantaged families, against “restitution” activities within the local community.

4. Research gap and design project

Projects concerning management of the unsold and of food waste are many all over the European Union. However, not always there is active participation by public bodies, or at least it does not seem to be so evident. From the information above, one can notice a wide dissemination of tools and initiatives meant to reduce the phenomenon; they act on several variables: communication and sensitization, collection and distribution of the unsold, social inclusion, equal access to primary resources, formation and volunteering. In this sense, in the North-West of Italy initiatives are numerous and they satisfy most of these aspects. However, the regional bodies of the Aosta Valley and of Piedmont noticed lack of communication on good eating habits and proper food management.

Consequently, two Research Questions (RQ) have been formulated:

- RQ. 1: *which is the best method to communicate the food waste phenomenon?*
- RQ. 2: *which are the tools needed for teaching the best way to manage food waste?*

In order to attain the scope of study, the project was planned towards the implementation of a model structured in several phases. This model was divided into six phases: the *Initiation phase* is dedicated to exploring and elaborating the idea as well as evaluating its feasibility; the *Definition phase* defines the requirements to attain the scope of project; the *Design phase* provides and develops one or more designs to achieve the scope of project; the *Development phase* provides and collects everything needed for the implementation of the project; the *Implementation phase* involves the “making” to transform the design into the product and to give visibility to the project. In this phase the requirements of the Definition phase must be met; the *Follow-up and improvement phase* involves evaluation and inspection of the project outcome and, where needed, its improvement.

5. “Una Buona Occasione” initiative

The Piedmont and Valle d'Aosta Regions (North West Italy) have been involved in the set-up of the “A GOOD OPPORTUNITY (Una Buona Occasione)” project. The scope of this initiative is promotion of consumer awareness through a variety of tools i.e. a new design for rural economy to eliminate surplus production and, when necessary, the reuse of this surplus. Hopefully, all these activities will lead to a better management of the crucial relationship between production and distribution operators, which includes education on food consumption to reduce food waste in food services. On the basis of information collected through literature review and of several European and Italian initiatives in this field, the “Una Buona Occasione” project was implemented as follows.

Initiation phase: core of the project

The project has been centred on the necessity to communicate and dispel the myth of the minimum durability date as an absolute border between what is good before it and then

suddenly is not good any more. The activity is therefore directed at working out means of communication suitable for disseminating good eating habits among citizens by: clarifying some obscure aspects of food rules; carrying out studies apt to produce useful information for conscious food consumption; sharing information and results obtained by third parties aiming at conscious food consumption.

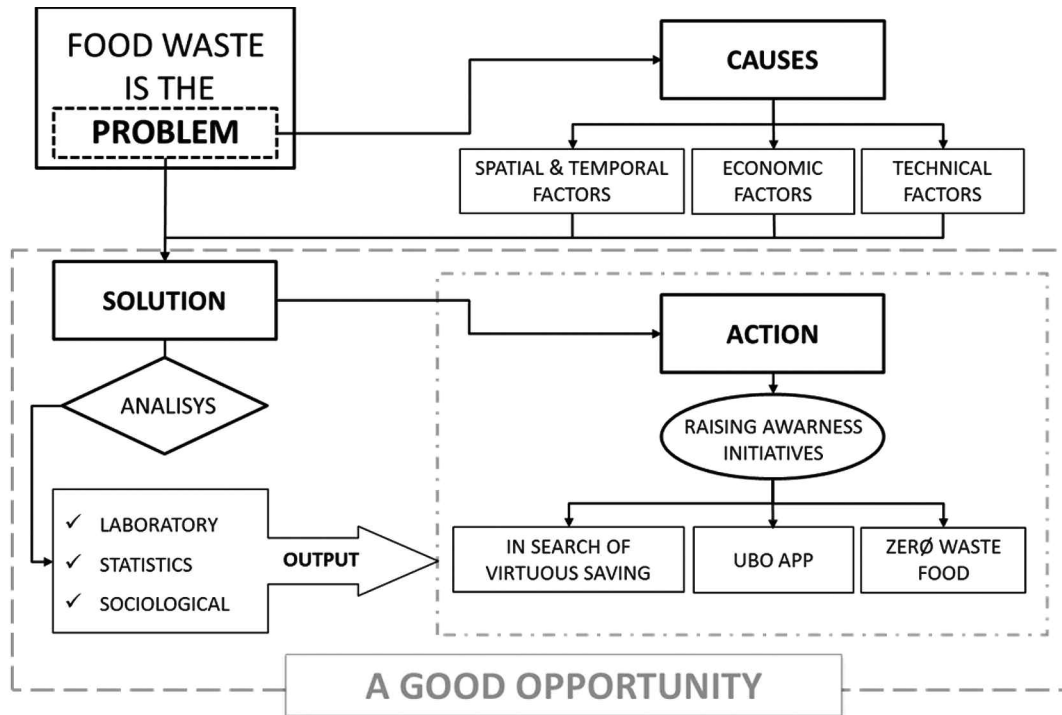
Definition phase: structural requirements

In this phase, factors negatively affecting knowledge transfer on principles connected to the phenomenon of food wastage have been singled out and analyzed. In particular, some factors determining this phenomenon have been focused on; they can be subdivided into: technical factors, such as foodstuff perishability, enforcement of legislation on food safety, food storage and preservation techniques; space and time factors, such as the

transport phase and preparation processes; socio-economic factors, such as tastes, preferences and consumers' individual meal habits, costs undergone in order to recuperate and change the destination to another use. Once the causes have been identified, criteria are set in order to define solutions useful for attaining the project scope.

Design phase: Flow chart

In order to reach the objective set by the project, a flux diagram has been defined, i.e. a conceptual map for identifying the various activities to be carried out. More specifically, following have been highlighted: the potential causes of the phenomenon, the various operational fields oriented by laboratory analysis, statistical survey, sociological analysis, and the possible actions to be implemented in order to intervene in the identified channel, i.e. information and promotion tools (Graph 1).



Graph 1. Flow chart of the "A Good Opportunity" project
Source: Authors' elaboration

Development phase. This phase has been structured into three parallel activities directed at the creation of a collection of information to be used in the following phase of implementation. In practice, an analytical deepening in the chemical, statistical and sociologic field has been carried out.

Laboratory analyses. A series of laboratory analyses have been made, aimed at clarifying what happens to foodstuffs when they reach their expiry date or the date by which, according to producers, they should 'preferably' be consumed. For this test the choice fell on foodstuffs which may raise some problematic aspects as far as preservation is concerned (UHT milk, puff pastry, strawberry yoghurt, pasteurised milk, stuffed fresh pasta, cooked ham in cubes); 5 out of 6, in fact, are under a deadline regime of exclusively public matrix. The results achieved by the study show that during the *shelf-life* period foreseen by the producer nearly all examined products, though showing up a more or less marked chemical-physical, microbiologic and consequently sensorial evolution, keep their compositional, pleasantness and purchase attraction characteristics practically unaltered in time. This evolution shows strict correlation first of all with the producing firm, and therefore with the various technologic-productive aspects. Secondly, the compositional evolution is obviously correlated with the type of product, and therefore with its greater or smaller intrinsic "resistance" to

preservation. The positive results obtained by the study also need to be related to the perfect preservation conditions the products have undergone, which are a fundamental element for keeping the compositional and sensorial characteristics even at the end of the *shelf-life* foreseen by the producer.

Statistical survey. The statistical survey aims at verifying the actual behaviours of Piedmontese and Aosta Valley consumers at the time when they purchase and consume foodstuffs. The survey on a random sample of Piedmontese and Aosta Valley families had the objective to define different profiles in the behaviour of purchasing and consuming foodstuffs. The results obtained indicate that there is not yet adequate knowledge concerning the two different wordings «Use by» and «Best before»; in the first case, 61.9% of the panel think that after the stated date this foodstuff might harm health; in the second case, on the contrary, there is no predominant reply: after that date the foodstuff might harm health according to 17.9% of the panel, might have lost nutritional value according to 23%, might have lost taste or aroma according to 26.6%; 22.1% of the panel replied *other*, while 10.5% *does not know*. Furthermore, 36% of the interviewed people declare that they will not consume a product after the indicated date even if the product has good appearance, smell and taste; 25% consume it only if just a few days have passed, and 18.5% consume it without considering

the time gone by.

Sociologic analysis. The sociologic analysis was dedicated to the matter of home food waste. This phenomenon was examined in the light of the post-growth model, which postulates a rethink on consumerism by modifying consumers' lifestyles and behaviour. In this perspective, the role of the economic crisis in transforming consumption, the change of values in terms of ethics and sustainability, the nature of waste on a national level were analysed. The results obtained evidenced that actions aimed at reducing home waste involve all actors in the chain, including institutions and organizations operating in the field of food education and responsible consumption. They can disseminate knowledge of good practices to be followed and can side their implementation by impacting on consumer behaviour and thus on the amount of wastage. Furthermore, the analysis highlights how economic need, value orientation addressed at ethics and sustainability and individual interest for allocating one's income in the best way may stimulate application of waste reducing practices. Consequent policies should concern sensitization to the environmental and ethical issues of solidarity, availability of information and "techniques" facilitating waste reduction for consumers, evaluation of the consumption work needed to reduce wastage, the individual interest and the activation of mechanisms enabling individuals to pursue it with greater rationality, operating the choices which are best for themselves.

Implementation phase. In this phase the sensitization and promotion campaign was carried out; it was structured in three different communication instruments.

The first, called "*Alla ricerca del risparmio virtuoso - In search for virtuous saving*" was designed by involving Large Distribution. During the spring/summer 2014 period, in fact, following indications from the Retail Forum for Sustainability 2012 on actions Large Distribution should apply in order to reduce food waste (promotional offers for products close to their expiry date; informative tools dedicated to consumers on the exact meaning of expiry dates), "Una Buona Occasione" started an initiative which 275 large sale structures participated in (263 in Piedmont and 12 in the Aosta Valley); these structures were characterised by 10 trademarks from Federdistribuzione i.e. Distribution Companies Association, 2 cooperative trademarks and one biologic product trademark, and they reduced the price of food products close to their expiry date by at least 30%. Within this initiative, information materials on correct label reading and sensitization materials on the appropriateness of wasting less food (and on how to do it) were distributed. With reference to correct label reading, brochures were prepared for following products: tomato puree, milk, eggs, oil, ice cream; the symbols on the labels were of voluntary character. In 2015 "bio" shops, specialized in selling biological products, and "*botteghe del mondo - world corner shops*", dedicated to Fair Trade products, were involved.

The second, named "*UBO App*", is a mobile application providing advice on the appropriate storage conditions for products, portioning and cooking leftovers. In addition, it provides information about seasonality, historical and geographical origins of products, zero waste recipes and the possibility to write down one's own shopping list. UBO App analyses more than 500 products (raw and cooked, pre-packaged and unpackaged, fresh and frozen) and is unique on a national and possibly international level. The target is composed of digital natives, whose knowledge about household economy has often decreased. Piedmont and Aosta Valley have decided to change the Zoo-prophylactic Experimental Institute (very active against BSE) to collect the main database information in order to enhance the project's reliability and credibility. The app is available for free on Android and IOS devices.

The third was about making a film able to rapidly and clearly communicate concepts connected with the necessity to reduce waste. In particular, at first a video titled "*Zerøspreco - Zerø*

Waste" has been shot: it is a 7" cartoon on food waste made by the National School of Cinema and addressed to primary and middle school students. The protagonists are two dogs facing the problem of food waste in ordinary life, who decide to analyse the phenomenon's main causes. This cartoon pursues the objective of rising an educational debate on the topic. As a second step, a film named "Water Hunters" was implemented. It is dedicated to water waste.

Follow-up and improvement phase. The initiatives developed during the three-year-period 2014/2016 have been monitored and improved and/or renewed over time. Examples are the activity carried out in the asset "*Alla ricerca del risparmio virtuoso*", which has been modified and extended to different categories of stakeholders year by year, and the shooting of a new film concerning a particular kind of wastage, i.e. water waste. The "Una Buona Occasione" website is the real time coordination and communication instrument for updates and ongoing upgrades brought to the initiative in a view of continuous improvement.

6. Conclusion, limitations and future research

Food wastage is an issue generating various kinds of crucial issues, shared by the various chain phases. Several factors (USDA, 2014) can impact with a multiplier effect on food waste production: however, losses and waste generated along the production chain can be reduced by using correct expedients.

At present time, what seems to be missing is full awareness of the phenomenon's dimensions: FSOs (Food System Operators) and consumers are not always able to coherently evaluate their actions within respect for the environment and the society (La Barbera et al., 2014; Lanfranchi et al., 2016; Bollani et al., 2017; De Hooge et al., 2017; McCarthy and Liu, 2017). At the same time, as seen, estimates produced on this phenomenon are unable to dispel doubts on the true entity of the problem. The present way of living seems to be unsustainable and anthropic activities directly or indirectly represent a growing quota of the impacts generating a negative effect on the environment. These activities are mainly not voluntary, proving that present information and education means are inefficient (Thøgersen, 2014). It is also proven that, at least with reference to the consumption phase, implementation of a row of strict devices, such as taxation, regulation and services, as well as less strict ones, i.e. changes in behaviour, can lead to important results in terms of waste reduction (Fell et al., 2010).

Studies directed at finding out one or more alternatives for a significant food wastage reduction are numerous. For instance, Halloran et al. (2014), based on in-depth analyses carried out in Denmark, remind that possible solutions to waste reduction can be found, with reference to the more downstream chain phases, through better communication, more efficient packaging and deeper awareness of the information offered on labels; with regard to the more upstream phases, a different production philosophy, supporting farming systems characterized by increased sustainability and market integration, would be desirable. In general, in any case, integrated collaboration between the various FSOs and final consumers would be appropriate. Quested et al. (2013) highlight the importance of organizing a public campaign able to trigger virtuous behaviours concerning home food wastage reduction and management in the United Kingdom.

The various European proposals presented above also show that several paths can be followed towards the ultimate end of managing food wastage. Other kinds of projects, however, suggest how to prevent wastage. In this context, the "Una Buona Occasione" initiative synthesizes a full row of useful devices, such as the importance of relocating the agricultural economy against overproduction, of the reuse of surplus in order

to limit criticalities in contractual bonds between production and distribution, of consumption formation and education in order to avoid wastage both in catering (*doggy bag*) and in home use. The limits of the initiative are however evident: while it is useful for reducing the phenomenon, it cannot be considered the “solution”.

It is worth underlining, on a different note, that the former criticality of the initiative deriving from promotion and dissemination mainly on an inter-regional level (Regions Piedmont and Aosta Valley) has been remedied by the national award “Vivere a spreco zero (*Living at zero waste*)” which was bestowed upon the project in 2014 by the Italian Minister of Environment, Gianluca Galletti. This recognition enabled the project to obtain visibility and resonance on a national level.

According to the information presented in this study, the need for a structural intervention apt to change the mechanisms of the conventional agro-food system seems clear. Hudson and Messa (2014) talk in favour of designing policies aimed at reducing the food waste problem at its origin, suggesting an entirely “value related” vision of the agro-food business; the various institutional initiatives should be oriented in this sense.

References

- [1] Amato M., Musella M. (2017). Quantification of food waste within food service in the historic centre of Naples: A case study. *Quality - Access to Success*. 18(S2), 22-28.
- [2] ANDES. Le réseau des épiceries solidaires. Available online: <http://www.epiceries-solidaires.org/> (accessed on 4 April 2018).
- [3] Andreopoulou Z. (2017). Internet of Things and food circular economy: A new tool for Sustainable Development Goals. *Rivista di Studi sulla Sostenibilità*, (2), 43-49.
- [4] Associazione Italiana Sommeliers. “Portami Via”, campagna a favore del buon vino. Available online: <http://www.aisitalia.it/portami-via.aspx#.VNTqAS7UeQU> (accessed on 8 March 2018).
- [5] Barba, M. Díaz-Ruiz, R. (2015). *Switching imperfect and ugly products to beautiful opportunities*. In *Envisioning a Future without Food Waste and Food Poverty: Societal Challenges*. Academic Publishers, Wageningen. pp. 279-284.
- [6] Barilla CFN (2012). Lo spreco alimentare: cause, impatti e prodotti. Available online: http://www.barillacfn.com/wp-content/uploads/2012/11/WEB_ITA.pdf (accessed on 2 April 2018).
- [7] Beausang C., Hall C., Toma L. (2017). Food waste and losses in primary production: Qualitative insights from horticulture. *Resources, Conservation and Recycling*. 126, 177-185, DOI: doi.org/10.1016/j.resconrec.2017.07.042
- [8] Bollani L., Peira G., Varese E., Nesi E., Pairotti M. B., Bonadonna A. (2017). Labelling and sustainability in the green food economy: Perception among millennials with a good cultural background, *Rivista di Studi sulla Sostenibilità*. 2, 83-101. DOI: 10.3280/RISS2017-002007
- [9] Borrello M., Caracciolo F., Lombardi A., Pascucci S., Cembalo L. (2017). Consumers' perspective on circular economy strategy for reducing food waste, *Sustainability*. 9:1, 141. DOI: 10.3390/su9010141.
- [10] Borrello M., Lombardi A., Pascucci S., Cembalo L. (2016). The seven challenges for transitioning into a bio-based circular economy in the agri-food sector, *Recent Patents on Food, Nutrition and Agriculture*. 8:1, 39-47. DOI: 10.2174/2212798408
- [11] BUTA STUPA. Buta Stupa, la wine bag italiana cambia per darti nuovi servizi. Available online: <http://butastupa.eu/> (accessed on 22 March 2017).
- [12] Buzby, J.C., Wells, H.F., & Hyman, J. (2014). *The Estimated Amount, Value, and Calories of Postharvest Food Losses at the Retail and Consumer Levels in the United States*. In E. R. Service (Ed.). Washington, DC: U.S.
- [13] Calabrò G., Vieri S. (2017). The reorganization of agricultural production patterns and food consumption for managing critical issues of current models. *Quality - Access to Success*, 18: 160, 124-129.
- [14] Canali M., Amani P., Aramyan L., Gheoldus M., Moates G., Östergren K., Silvennoinen K., Waldron K., Vittuari M. (2017). Food waste drivers in Europe, from identification to possible interventions. *Sustainability*. 9: 1, 37.
- [15] Cantino V., Devalle A., Cortese D., Ricciardi F., Longo M. (2017). Place-based network organizations and embedded entrepreneurial learning: Emerging paths to sustainability. *International Journal of Entrepreneurial Behaviour and Research*. 23:3, 504-523.
- [16] Caplan, P. (2017). Win-win?: Food poverty, food aid and food surplus in the UK today. *Anthropology Today*. 33:3, 17-22.
- [17] Cicatiello C., Franco S., Pancino B., Blasi E. (2016). The value of food waste: An exploratory study on retailing. *Journal of Retailing and Consumer Services*. 30, 96-104. DOI: doi.org/10.1016/j.jretconser.2016.01.004
- [18] Comune di Torino. Recupero alimenti: il progetto Buon Samaritano. Available online: http://www.comune.torino.it/ambiente/rifiuti/raccolta_diff/buon-samaritano.shtml (accessed on 22 March 2017).
- [19] COOP. Buon Fine e Brutti ma Buoni. Available online: <http://www.e-coop.it/web/politiche-sociali/buon-fine> (accessed on 22 March 2018)
- [20] De Hooge, I.E., Oostindjer, M., Aschemann-Witzel, J., Normann, A., Loose, S.M., Almlí, V.L. (2017). This apple is too ugly for me! Consumer preferences for suboptimal food products in the supermarket and at home. *Food Quality and Preference*. 56, 80-92
- [21] Ellen MacArthur Foundation (2013). *Towards the Circular Economy*. EMF, Isle of Wight. Volume 1.
- [22] Eriksson M., Spångberg J.; (2017). Carbon footprint and energy use of food waste management options for fresh fruit and vegetables from supermarkets. *Waste Management*. 60, 786-799, DOI: doi.org/10.1016/j.wasman.2017.01.008
- [23] Eriksson M., Strid I.; Hansson, P.A. (2012). Food losses in six Swedish retail stores: Wastage of fruit and vegetables in relation to quantities delivered. *Resources, Conservation and Recycling*. 68, 14-20, DOI: doi.org/10.1016/j.resconrec.2012.08.001
- [24] EU. Commission staff working document impact assessment on measures addressing food waste to complete SWD (2014). 207 regarding the review of EU waste management targets. Available online: <http://register.consilium.europa.eu/doc/srv?l=EN&t=PDF&f=ST+11598+2014+ADD+12> (accessed on 10 February 2018).
- [25] EU. European Parliament resolution of 19 January 2012 on how to avoid food wastage: strategies for a more efficient food chain in the EU. Available online: <http://www.europarl.europa.eu/sides/getDoc.do?pubRef=-//EP//TEXT+TA+P7-TA-2012-0014+0+DOC+XML+V0//EN> (accessed on 11 March 2018).
- [26] EU. What can I do in my daily life to limit food waste? Available online: http://ec.europa.eu/food/safety/food_waste/library/docs/tips_stop_food_waste_en.pdf (accessed on 11 March 2018)
- [27] European Commission (2018). Market study on date marking and other information provided on food labels and food waste prevention. Available online <https://publications.europa.eu/en/publication-detail/-/publication/e7be006f-0d55-11e8-966a-01aa75ed71a1/language-en> (accessed on 11.04.2018).
- [28] FA BENE. Available online: <http://www.fabene.org/progetto/> (accessed on 8 March 2018).
- [29] FAO. Food wastage footprint Impacts on natural resources, summary report. Available online: <http://www.fao.org/docrep/018/i3347e/i3347e.pdf> (accessed on 20 March 2018).
- [30] FARESHARE. Fighting hunger, tackling food waste. Available online: <http://www.fareshare.org.uk/our-work/> (accessed on 16 January 2018).
- [31] Fell, D., Cox, J., Wilson, D.C. (2010). Future waste growth, modelling and decoupling, *Waste Management and Research*. 28(3). 281-286.
- [32] Fiore M.A., Contò F., Pellegrini G. (2015). Reducing food losses: A (dis-)opportunity cost model. *Rivista di Studi sulla Sostenibilità*. 1, 151-166.
- [33] FOOD CYCLE. FoodCycle Fact Sheet. Available online: <http://foodcycle.org.uk/wp-content/uploads/2015/01/FoodCycle-Fact-Sheet-January-2015.pdf> (accessed on 22 January 2018).
- [34] FOOD CYCLE. Where communities unite to make sure no good food is wasted. Available online: <http://foodcycle.org.uk/> (accessed on 11 April 2018).

- [35] Foti V.T., Sturiale L., Timpanaro G. (2018). An overview of food waste phenomenon: By problem to resource. *Quality - Access to Success*. 19 (S1), 232-240.
- [36] Franchetti M. (2016). Development of a novel food waste collection kiosk and waste-to-energy business model. *Resources*. 5:3, 26.
- [37] Geissdoerfer M., Savaget P., Bocken N.M.P., Hultink E.J. (2017). The Circular Economy – A New Sustainability Paradigm?, *Journal of Cleaner Production*. 143, 757-768, DOI: 10.1016/j.jclepro.2016.12.048
- [38] Göbel C., Langen N., Blumenthal A., Teitscheid P., Ritter G. (2015). Cutting food waste through cooperation along the food supply chain. *Sustainability*. 7: 2, 1429-1445.
- [39] Gustavsson J., Cederberg C., Sonesson U., Van Otterdijk R., Meybeck A. (2011). Global Food Losses and Food Waste. FAO Report. Rome. Available online: www.fao.org/docrep/014/mb060e/mb060e.pdf (accessed on 2 February 2018).
- [40] Halloran A., Clement J., Kornum N., Bucatariu C., Magid J. (2014). Addressing food waste reduction in Denmark. *Food Policy*. 49: 294-301.
- [41] Hermsdorf D., Rombach M., Bitsch V. (2017). Food waste reduction practices in German food retail. *British Food Journal*. 119: 12, 2532-2546.
- [42] Hudson U., Messa M. (2014). Documento di posizione sulle perdite e gli sprechi alimentari, Slow Food. Available online: <http://www.slowfood.com/sloweurope/wp-content/uploads/ITA-position-paper-foodwaste.pdf> (accessed on 22 January 2018).
- [43] IL BUONO CHE AVANZA. Reti di ristoranti contro lo spreco. Available online: <http://www.ilbuonocheavanza.it/progetto.html> (accessed on 12 January 2018).
- [44] IME. Global Food Waste Not, Want Not. Available online: www.imeche.org/docs/default-source/reports/Global_Food_Report.pdf?sfvrsn=0 (accessed on 12 January 2018).
- [45] Jörisen J., Priefer C., Bräutigam K.-R. (2015). Food waste generation at household level: Results of a survey among employees of two European research centers in Italy and Germany. *Sustainability*, 7: 3, 2695-2715.
- [46] Jurgilevich A., Birge T., Kentala-Lehtonen J., Korhonen-Kurki K., Pietikäinen J., Saikku L., Schösler H. (2016). Transition towards circular economy in the food system, *Sustainability*. 8:1, 1-14, DOI: 10.3390/su8010069
- [47] Juul, S. (2015). You have the power to stop wasting food. In *Envisioning a Future without Food Waste and Food Poverty: Societal Challenges*; Academic Publishers, Wageningen; pp. 165-169.
- [48] La Barbera F., Del Giudice T., Sannino G. (2014). Are people willing to pay for waste prevention? the moderating role of environmental attitude. *Quality - Access to Success*, 15 (SUPPL.1): 213-218.
- [49] Lanfranchi M., Calabrò G., De Pascale A., Fazio A., Giannetto C. (2016). Household food waste and eating behavior: empirical survey. *British Food Journal*. 118: 12, 3059-3072.
- [50] Lanfranchi M., Giannetto C. (2017). Economic analysis of food waste in the catering activity: Results of a survey conducted in South Italy. *Quality - Access to Success*. 18: 159, 105-110.
- [51] Lanfranchi M., Falco N.D., Santagada R., Sippelli S., Giannetto C. (2018). Analysis and models for the reduction of waste in organized large-scale retail distribution: "The tomato", *Quality - Access to Success*, 19:162, 130-133.
- [52] LAST MINUTE MARKET. Available online: http://www.lastminutemarket.it/chi_siamo (accessed on 22 January 2018)
- [53] Lebersorger S., Schneider F. (2014). Food loss rates at the food retail, influencing factors and reasons as a basis for waste prevention measures. *Waste Management*. 34, 1911-1919, DOI: doi.org/10.1016/j.wasman.2014.06.013
- [54] LMM. Un anno contro lo spreco. Available online: <http://www.unannocontrolospreco.org/it/> (accessed on 17 January 2018).
- [55] LMSC. Last Minute Sotto Casa. Available online: http://www.lastminutesottocasa.it/how%20it%20work/Guida_LMSC.pdf (accessed on 22 January 2018)
- [56] Lundqvist J. (2009). Losses and waste in the global crisis. *Reviews in Environmental Science and Bio/Technology*, 8: 121-123
- [57] Marklinder I., Eriksson M.K. (2015). Best-before date – Food storage temperatures recorded by Swedish students. *British Food Journal*, 117: 6, 1764-1776.
- [58] McCarthy B., Liu, H.-B. (2017). 'Waste not, want not': Exploring green consumers' attitudes towards wasting edible food and actions to tackle food waste. *British Food Journal*, 119: 12, 2519-2531.
- [59] McDonough, W., Braungart, M. (2002). *Cradle to cradle: Remaking the way we make things*, 1st ed. North Point Press, New York.
- [60] MINIAMBIENTE. Grande successo per la Giornata di Prevenzione dello Spreco alimentare. Available online: <http://www.minambiente.it/comunicati/grande-successo-la-giornata-di-prevenzione-dello-spreco-alimentare> (accessed on 14 April 2018)
- [61] Mondéjar-Jiménez J.A., Ferrari G., Secondi L., Principato L. (2016). From the table to waste: An exploratory study on behaviour towards food waste of Spanish and Italian youths, *Journal of Cleaner Production*, 138:1, 8-18, DOI: doi.org/10.1016/j.jclepro.2016.06.018.
- [62] Nahman A., de Lange W., Oelofse S., Godfrey L. (2012). The costs of household food waste in South Africa, *Waste Management*, 32, 2147-2153, DOI: doi.org/10.1016/j.wasman.2012.04.012
- [63] Newsome, R., Balestrini, C. G., Baum, M. D., Corby, J., Fisher, W., Goodburn, K., et al. (2014). Applications and perceptions of date labeling of food. *Comprehensive Reviews in Food Science and Food Safety*, 13(4), 745-769.
- [64] Parfitt J., Barthel M., Macnaughton S. (2010). Food waste within food supply chains: quantification and potential for change to 2050. *Philosophical Transaction of the Royal Society B*, 365: 3065-3081.
- [65] Peira G., Bollani L., Giachino C., Bonadonna A. (2018). The management of unsold food in outdoor market areas: Food operators' behaviour and attitudes, *Sustainability*, 10: 4, 1180; doi:10.3390/su10041180.
- [66] Peri C. (2006). The universe of food quality. *Food Quality and Preference*, 17, 3-8.
- [67] Piano Nazionale di Prevenzione degli Sprechi Alimentari. Available online: http://www.minambiente.it/sites/default/files/archivio_immagini/Galletti/Comunicati/PINPAS%2010%20MISURE%20PRIORITARIE%205%20GIUGNO%202014.pdf (accessed on 12 April 2018)
- [68] Pierson, T.R., Allen, J.W., McLaughlin, E.W., & Halloran, J.M. (1982). Food Losses: Overview and Summary, Agricultural Economics, Report 421, Michigan, *Agricultural Experiment Station Journal*. <http://ageconsearch.umn.edu/record/201305/files/agecon-msu-421.pdf> (accessed on 7 April 2018).
- [69] Porat R., Lichter A., Terry L.A., Harker R., Buzby J. (2018). Postharvest losses of fruit and vegetables during retail and in consumers' homes: Quantifications, causes, and means of prevention. *Postharvest Biology and Technology*, 139, 135-149. DOI: <https://doi.org/10.1016/j.postharvbio.2017.11.019>
- [70] Quedstedt T.E., Marsh E., Stunell D., Parry A.D. (2013). Spaghetti soup: The complex world of food waste behaviours. *Resources, Conservation and Recycling*, 79: 43-51.
- [71] Regione Piemonte; available online: <http://www.unabuonaoccasione.it/it/app> and <http://www.unabuonaoccasione.it/en/com-virtuemart-menu-manufacturers/app-en> (accessed on 4 April 2018).
- [72] Regione Piemonte, available online: <http://www.unabuonaoccasione.it/it/date-di-scadenza/campagne-di-sensibilizzazione/alla-ricerca-del-risparmio-virtuoso> (accessed on 8 May 2017).
- [73] Regione Piemonte, available online: <http://www.unabuonaoccasione.it/it/partecipa/zerospreco-cartoon> (accessed on 8 May 2017).
- [74] Rivero R., Amato M., La Barbera F. (2017). The effect of food waste habit on future intention to reduce household food waste, *Quality - Access to Success*, 18(S1): 369-375.

- [75] Scuderi A., Lo Giudice V., Foti V.T. (2015). Economic analysis of education farms in Sicily. *Quality - Access to Success*, 16(S1): 252-259.
- [76] Segrè A., Falasconi L. (2011). *Il libro nero dello spreco in Italia: il cibo*, Edizioni Ambiente, Milano.
- [77] Smil V. (2004). Improving Efficiency and Reducing Waste in Our Food System, *Environmental Sciences*, 1:1, 17-26.
- [78] STOP WASTING FOOD. Available online: <http://www.stopspildafmad.dk/inenglish.html> (accessed on 16 March 2018).
- [79] Stuart T. (2009). *Sprechi. Il cibo che buttiamo, che distruggiamo, che potremmo utilizzare*, Bruno Mondadori, Milano, 47-52.
- [80] Thøgersen, J. (2014). Unsustainable consumption: Basic causes and implications for policy, *European Psychologist*, 19(2), 84-95.
- [81] UNABUONAOCASIONE. I possibili rimedi. Available online: <http://www.unabuonaoccasione.it/it/lotta-agli-sprechi/cosa-c-e-da-sapere/i-possibili-rimedi> (accessed on 11 March 2018).
- [82] USDA (United States Department of Agriculture) (2014). The Estimated Amount, Value, and Calories of Postharvest Food Losses at the Retail and Consumer Levels in the United States. Available online: https://www.ers.usda.gov/webdocs/publications/43833/43680_eib121.pdf?v=41817 (accessed on 11 March 2018).
- [83] Verghese K., Lewis H., Lockrey S., Williams H. (2013). The role of packaging in minimising food waste in the supply chain of the future. Final Report. RMIT University. Available online: <http://www.chep.com/foodwaste/> (accessed on 12 February 2018).
- [84] Vittuari M., De Menna F., Gaiani S., Falasconi L., Politano A., Dietershagen J., Segrè A. (2017). The second life of food: An assessment of the social impact of food redistribution activities in Emilia Romagna, Italy. *Sustainability*, 9: 10, 1817.
- [85] Wilson N.L.W., Rickard B.J., Saputo R., Ho S.-T. (2017). Food waste: The role of date labels, package size, and product category, *Food Quality and Preference*, 55; 35-44.
- [86] WRAP. Available online: <http://www.wrap.org.uk/> (accessed on 27 March 2018).
- [87] WRAP (2009). Household Food and Drink Waste in the UK. Report prepared by WRAP. In: <http://www.wrap.org.uk/sites/files/wrap/Household%20food%20and%20drink%20waste%20in%20the%20UK%20-%20report.pdf> (accessed on 27 March 2018).