

Losses and waste in food supply chain – the context of sustainable development, product management, CSR and market communication

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Introduction

The growing problem of food losses and waste is a consequence of structural changes of the food market and the needs of buyers, but is also an integral part of the problems in the food chain management in context of sustainable development. Very important in this situation has a comprehensive management throughout the food chain and market communication, in particular risk communication. Appropriate communication should be carried out also because of the growing importance of corporate social responsibility (CSR) [Wrzosek et al 2014]. Food losses and waste are the consequence of failure of this system and unreasonable towards the development of the food market. You should also look at a food losses and waste relate to different dimensions perception of product from the point of view of the consumer and product management processes.

Effective management processes throughout the food chain "from farm to fork" is an important area of product management process, and it involves the ability to reduce losses and waste of these products. Product management constitutes one of the basic functions of the production process management, which is typically the responsibility of the producers (suppliers) but increasingly also of the recipients (the commerce). Thus far, the available literature has been void of information on relations between these occurrences, which prompted the authors to undertake an analysis of the aforementioned processes as well as to conduct an empirical investigation. The essence of food product management is made up of all actions and decisions taken by the producers in the scope of shaping and developing the product [Krajewski 2010].

The concept of sustainable development is oft discussed topics in the context of food supply chain management. have been made to determine the optimal combination of corporate social responsibility and sustainable business development. According to most concepts, sustainable supply chain should take into account a reverse chain, but it is difficult in the case of food, due to safety and recovery conditions [Tanner 2016]

The study analyzes the food loss and waste in a triple perspective: the quality of product and processes, aspects of product management and marketing communication in relation to the concept of sustainable development (especially social and economic dimensions) and concept of corporate social responsibility.

Materials and methods

The problem formulated on the basis of studies and experience in EU countries, has been assessed under the conditions of Polish food market, especially the food supply chain, based on the results of previous studies of own in research project MOST and case study of the leaders polish market [Bilska et. al, 2016]. These analyzes were conducted based on the study of literature and our own observations of these processes. Taken analyze the efficiency of these processes was also the task, identify determinants of actions undertaken using innovative, customized solutions in the field of promotion. In particular, the study were existing and potential innovations in the communications market, based on non-standard forms of promotion on the food market.

The scope of the study of losses and waste in relation to sustainable development, includes an analysis of the conditions in the food chain, and methods of evaluation processes, product management: production, distribution and retailing, using process analysis and risk analysis, to determine the location and size of losses and waste on these processes and products. The purpose of the investigation was an analysis of the conditions for the food supply chain at a selected firms, using the loss risk analysis and the Ishikawa Diagram, in order to identify the locations and volumes of losses concerning these products.

The aim of this study, as part of market communication research, was to characterize the situation in terms of losses and waste in the food chain in selected enterprises, which introduce procedures for the recovery of products for social purposes. as part of a corporate social responsibility and concept of sustainable development. An attempt was made to assess the use of new communication tools market in these enterprises, to improve the image of these companies as companies seeking to differentiate itself in the market due to these two innovative strategies. This was done also analyze marketing processes, to identify the determinants of market activities undertaken using innovative, customized solutions in the field of promotion. The evaluation of these

processes has been focused on the effectiveness of innovative methods of promotion in the context of strategic actions undertaken by companies

Results and Discussion

1. Losses and Waste in Food Chain –the specificity and relationships between the processes and sustainable development

The kinetics of qualitative changes in the production and distribution processes during the lifetime of the products should be perceived, in accordance with the principles of commodity research, through the prism of sustainable development [Żuchowski 2008]. Qualitative changes of food products, as analysed against the background of their environmental impact, require assessment of these processes, not only in the phase of shaping and using the products, but also in the phase of disposal thereof, with reference to possible recycling options [Pilarczyk, Nestorowicz 2010]. At the same time, this is an area of interest for product management processes. Taking into account the scarcity of the resources and the barriers to the absorption capacity of the natural environment, the aim should be to close the product life-cycle, wherever possible, through processes of recovering the unmerchantable precious products or the ingredients thereof [Fiksel 2009, Brzustewicz 2013]. This kind of approach is tantamount to embracing the principles of sustainable development and constitutes an important area of interest for commodity research [Żuchowski 2008]. Investigation into utility value of the recovered products is of vital importance to sustainable development and enables determination of reasonable guidelines for utilising them in the course of constant process improvement [Żuchowski 2008].

Food losses imply reduced supply of food utilised in accordance with its intended purpose, resulting from mismanagement, errors and irregularities in the processes of managing it, including improper management, all taking place from the phase of production to the phase of distribution to end users. In Poland, nearly 9 million tonnes of food is wasted annually as a result of losses and mismanagement, which ranks our country in the fifth place among European Union countries [FAO 2013]. The problem of food losses does not only concern the scale of the occurrence but also the subsequent handling of the products withdrawn from the market while these are stored and processed, which has a negative impact on the natural environment. Appropriate management of the product and processes in the food chain provides the potential to reduce losses of these products and constitutes an essential area of product management processes.

The most common reasons for food losses include mechanical damages to raw and finished products, improper warehousing conditions, breaking the cold storage chain, failure to comply with commerce requirements and ineffective supply chains. Reasons may also include production line malfunctions leading to irregularities, failure to keep correct mass of the product, errors on packages, etc. An important aspect is also the problem of excessive production and overestimated orders, resulting from errors made while following the market demand mechanisms. This problem is also related to the seasonality of consumption of the products, as well as irrational management of the products, especially during sales peaks (holidays, long weekends, etc.),

Food product management represents a specific area of knowledge (and of decisions and practical skills) as well as an interest area for many scientific disciplines including mainly the economic sciences: commodity science, management, marketing and environmental science, as well as other sciences, technical and agricultural ones [Krajewski 2013]. One of the rational actions in the management process is striving to assure rational management of food products, which also implies reduction of losses of these products in the food chain.

According to Monier *et al.* [2010], the most important factors conditioning food losses and wastage along the feed chain should include: awareness, knowledge, attitude, preferences, portion size, planning your shopping, storage, social and economic factors, labelling, form and sort of packaging, manner of managing stocks, logistic processes, as well as quality requirements with regard to the product [Monier *et al.* 2010]. The most common reasons for food losses include mechanical damages to raw and finished products, improper warehousing conditions, breaking the cold storage chain, failure to comply with commerce requirements and ineffective supply chains. Reasons may also include production line malfunctions leading to irregularities, failure to keep correct mass of the product, errors on packages, etc. An important aspect is also the problem of excessive production and overestimated orders, resulting from errors made while following the market demand mechanisms. This problem is also related to the seasonality of consumption of the products, as well as irrational management of the products, especially during sales peaks (holidays, long weekends, etc.) [Krajewski *et al.* 2016].

The existing few assessments of the volume of losses within the scope of food distribution processes [Jones 2006] as well as own earlier research on dairy product trade [Wrzosek *et al.* 2014], give reason to embark on research aimed at providing a precise evaluation of the scale of losses at the stage of distribution, and then to take all effective actions in order to reduce them. One such effective research tool in this respect seems to be the loss risk analysis [Wrzosek *et al.* 2014]. The first stage of this analysis consists in defining all of the potential reasons to this phenomenon taking into account the characteristic features of the processes. A good research tool

is the Ishikawa Diagram (Figure 1) presenting the main determinants that have influence on losses, including the area of managing employees, processes and products.

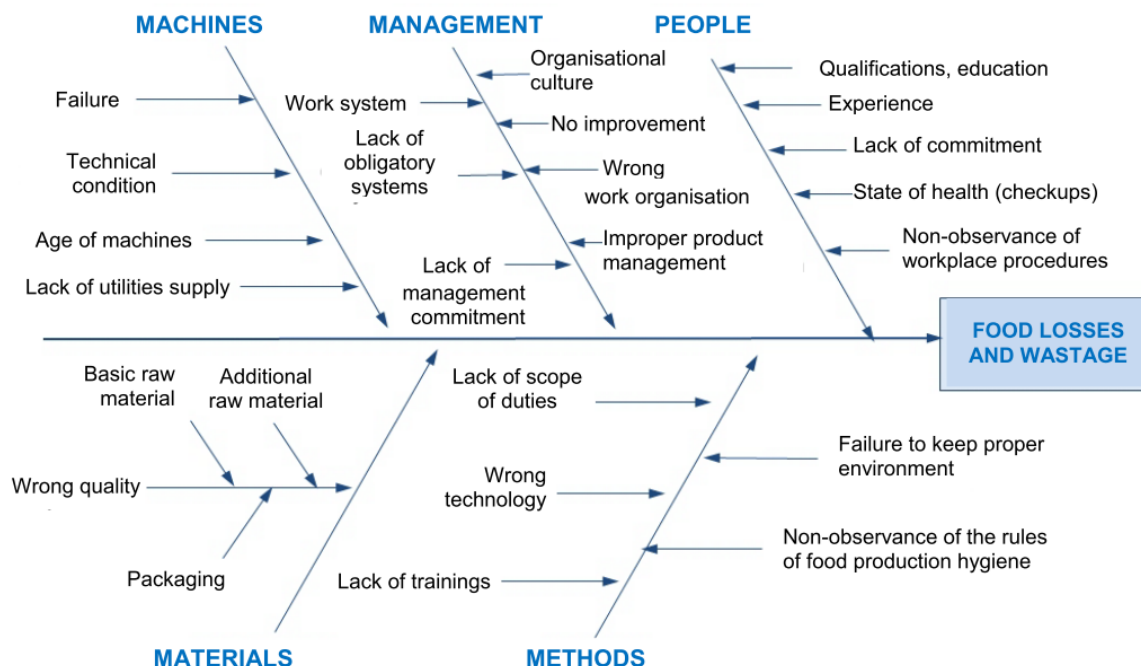


Figure 1. Reasons for food losses and waste, adapted from the Ishikawa Diagram

Source: Adapted from: [Wrzosek *et al.* 2014]

This is an extremely important aspect of shaping market phenomena and it relates to both the correct organisation of distribution and the product flow processes. All of the elements of the structure of production and distribution processes are interdependent because e.g. reception of an incorrectly labelled package from a supplier for trading (materials), failure to take it into account at the stage of packing the finished product (management) in connection with the human factor (methods – lack of trainings) will result in a product that cannot be forwarded for further marketing, and this may also result in supplying a product with irregular commercial characteristics [Bilska *et al.* 2016].

The food sector is internally very diverse, and individual food products supply chains require separate studies. Among the food products can be distinguished products with long shelf life (eg. coffee or pastry) and short one (eg. meat, or vegetables). Food sector has a significant impact on environmental pollution [Szmelter 2016]. According to Östlin 1/5 of the greenhouse gases is produced as a result of manufacturing and distribution of food [Östlin *et al.* 2008]. Agricultural production in Europe contributes significantly to environment pollution, including responsibility for: 90% ammonia compounds emission; 50-80% nitrogen loads discharged into freshwater; 10% greenhouse gas emissions (including 80% of methane emissions) [Rogers *et al.* 1998]. Among the food products is meat products, especially beef as the products with the most negative impact on the environment, which requires rational management of these products [Tucker, Jensen 2006].

The signalling by relevant entities of the occurrence of the problem of food wastage has contributed to actions being taken in order to discern in more detail the reasons and volume of this phenomenon in many countries. Due to the fact that each of food chain stages is different, this is a very difficult process and in view of the above it has been divided into appropriate food sectors. In this research, were presented results concerning the volume of meat products disposed of and consequently mostly wasted at the distribution centre in Poland in 2016 year.

2. Losses in Processes Meat Products Distributions and the Product Management – Research Results

The analysis of the processes of distribution of meat products points to the occurrence of losses of these products due to defects in the product management processes, such as the supply organisation, wrong packaging and standardisation of the expiry dates. The analysis comprised the number and characteristics of the claimed

products with reference to the reasons for this phenomenon and the option of redistributing them to charitable projects. Figure 2 shows a summary of the level of potential losses of meat products in the process of distribution through determination of the mass of the claimed products, with reference to the reasons and possible ways of utilising these products.

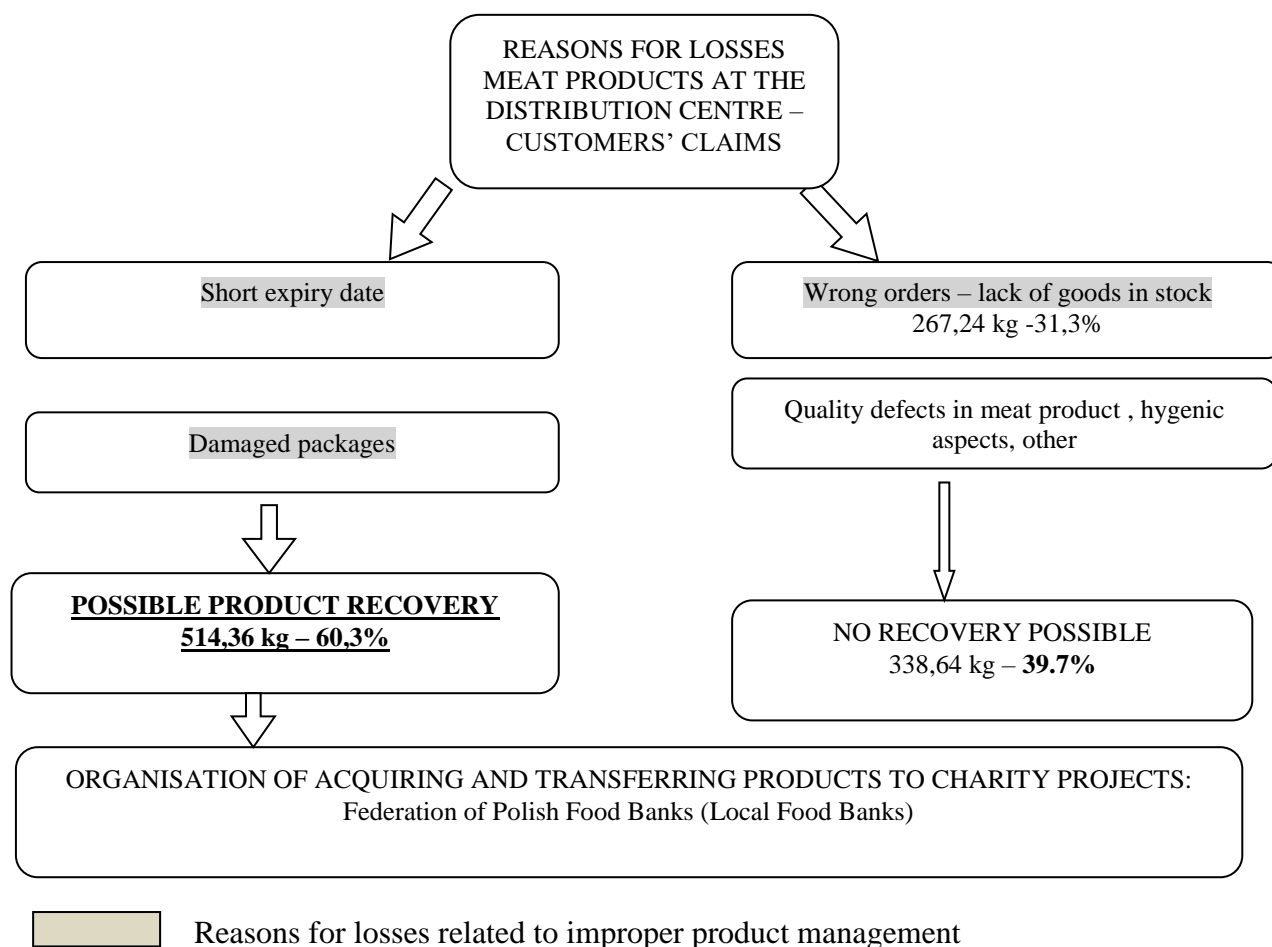


Figure 2. Reasons for losses of meat products in the distribution processes at the distribution centre under investigation and determination of the possibility of recovering and transferring them to charitable projects

Overall losses of meat products in the distribution process at the centre under investigation was estimated in year at the level of 1,25% of the distributed products. The total mass of products claimed by the market was estimated at 853 kg, of which 60,3% could be considered as suitable for further consumption. An essential reason that eliminated the products from the process of recovery and further transfer were major quality defects (71.4 .kg), e.g. mould growth due to leaky packaging allowing air migration inside and perishing of the food content, and therefore these products must be disposed of. The most common reason for claims recorded in the documentation at the distribution centre was the wrong number of goods in a supply (104.83 kg), which can be considered as an essential error in the process of product management.

Such defects in the management processes, as erroneously prepared label or external damages to collective packaging do not cause any qualitative changes and do not disqualify these products as suitable for consumption or render them harmful to the consumer's health. Such products can be provided for social purposes, eg. for the homeless.

It seems that the key area in the management of products (treated as an element of the CSR- approach) in the context of minimising their losses in the supply chain (trade and distribution) is preventing the exceeding of the expiry dates, which will make it possible to use the products for consumption purposes.

Research on the selection of useful forms of marketing communication for companies using CSR strategy was based on a panel of experts - managers of marketing departments. They considered to be one of the most

effective, non-standard forms of market communication (43% of respondents), for these companies, the formula guerilla marketing, as activity, combining a variety of media and the media, implemented at low cost. A characteristic feature of many non-standard forms of marketing communication (word of mouth marketing, viral or guerrilla) is that the use of these phenomena in networks (social networks) and to stimulate informal communication (gossip, information of mouth), hereinafter worth of mouth (WOM) [Świątkowska 2009].

Effects of mouth marketing, in the case of socially useful activities (as recovery of food products for social purposes). are spontaneous discussions consumers about a product or service that can not be specifically planned or controlled. The role of marketing experts in this case, is therefore limited primarily to stimulate and deliver the tools to communicate, exchange ideas, providing feedback and creating social networks.

As follows additionally from the presented analysis, in the 2016 the distribution centre under investigation disposed of 514,36 kg of meat products that were still suitable for consumption. Transferring this mass to the Federation of Polish Food Banks, some local Food Banks or other charitable organisations would not only be an act of charity but it would enable a reduction of costs due to disposal in the investigated period even by half.

Summary and Conclusions

- 1) The research carried out into the volume of losses at a selected distribution centre of meat products points to a relatively low level of these losses, and the main source and reason for these losses are limitations related to the expiry dates, amounting to 41% of losses of these products.
- 2) No relations are found in the food product management between this process and the reducing of food losses and continued extending of the management process towards actions constituting an element of the CSR strategy. The innovative approach to product management in food supply chain in the context of the CSR may be the key to increasing the social awareness in the scope of reducing food losses in Poland.
- 3) Analysis of existing and potential innovative solutions with regard to the promotion of food products based on non-standard forms of this promotion, indicates that these measures provide tangible benefits to companies applying these processes, especially when used in a comprehensive and interactive using technology and materials to support promotional activities and when these activities are a network.

References

- Bilska B., Wrzosek M., Kołożyn- Krajewska D., Krajewski K., 2016, *Risk of food losses and potential of food recovery for social purposes*. Waste Management 52, pp. 269-277
- Brzustewicz P., 2013, *Supply Chain Management and Product Life Cycle - Sustainability Perspective* (in Polish).
- Marketing i rynek, nr 12, pp. 8-13
- FAO 2013, *Food loss and food waste*, www.fao.org
- Fiksel J., 2009, *Design for Environment. A Guide to Sustainable Product Development*, The McGraw Hill, New York-Toronto 2009, p. 84
- Krajewski K., 2010, *Products management in food chain – aspects of market communications* (in Polish) Zeszyty Naukowe Uniwersytetu Ekonomicznego w Poznaniu, nr 153, pp. 100-108
- Krajewski K., 2013, *Food products management (in Polish)* (in): Górski- Warsewicz H., Świątkowska M., Krajewski K. *Food products marketing*. Oficyna Wolters Kluwer, Warszawa 2013, s.156-177
- Krajewski K., Lipińska M., Wrzosek M., Bilska B., Kołożyn-Krajewska D., 2016, *Food waste – four dimensions of security: economic, social, power and environmental* Intercathedra 32/2, pp. 47-53
- Krajewski K., Lipińska M., 2017, *Reduction of losses in the distribution of dairy products as part of Product Management*. Studia Oeconomica Posnaniensia vol 4, in press
- Monier V. (ed.), 2010, *Preparatory study on food waste across EU27*, accessed on 18.05.2017, http://ec.europa.eu/environment/eussd/pdf/bio_foodwaste_report.pdf
- Östlin J., Sundin E., Björkman M., *Importance of closed-loop supply chain relationships for product remanufacturing*, International Journal of Production Economics 2008, Vol. 115, Issue 2. 17.
- Pilarczyk B., Nestorowicz R., 2010, *Marketing of organic food products* (in Polish), Wolters Kluwer, Warszawa
- Rogers D. S., Tibben-Lembke R. S., *Going Backwards: Reverse Logistics Trends and Practices*, University of Nevada, Center for Logistics Management, Reverse Logistics Executive Council, 1998.
- Świątkowska M: 2009, *Non-standard forms advertising on food market (in Polish)*, Przemysł Spożywczy, 7, pp.33-36;
- Szmelter A., 2016, *Specifics of Closed Loop Supply Chain Management in the food sector*. Journal of Reverse Logistics 1/2016 (2) p. 14-19
- Tanner D., 2016, *Food quality, storage, and transport*, Reference Module in Food Sciences, <http://dx.doi.org/10.1016/B978-0-08-100596-5.03336-9>

- Tukker A., Jansen B., 2006, *Environmental impact of products: a detailed review of studies*, Journal of Industrial Ecology 2006, Vol. 10, no. 3, s. 159-182
- Wrzosek M., Bilska B., Kołożyn- Krajewska D., Krajewski K., 2014, *Reduce food losses in retail as part of socially responsible business* (in Polish), Roczniki Naukowe SERiA , tom 16, z. 6, pp. 541-546
- Żuchowski J., 2008, *Commodity science in the implementation of sustainable development strategy* (in Polish) [w:] J. Żuchowski (red). *Quality and safety of products in sustainable development*. Wyd. Politechnika Radomska, Radom, s.259-264