

THE ANALYSIS OF ENVIRONMENTAL COSTS IN THE FOODS RETAIL

Radojko LUKIC^{1*}, Djojo ARSENOVIC² Srdjan LALIC³

¹University of Belgrade, Faculty of Economy, Belgrade, Serbia

²University of East Sarajevo, Faculty of Agriculture, Bosnia and Herzegovina

³University of East Sarajevo, Faculty of Business Economy, Bijeljina, Bosnia and Herzegovina

*(Corresponding author: rlukic@ekof.bg.ac.rs)

Abstract

This paper, considering the meaning of the problem treated, deals with research of determinants of dynamics and specificities of the environmental cost structure-ecological costs, as well as their influence on performances in the food retail. Three significant categories of the environmental costs in the food retail are as follows: energy consumption, carbon dioxide emission, and water consumption. For purpose of optimization of influence of all, above stated, the most possible control is required.

Key words: Renewable energy, greenhouse effect gas emission, water, supply chain.

JEL Classification : D40 L81 M41

Introduction

In this paper, considering the meaning of the problem researched, a special note is given to: meaning of the food sector, specificities of environmental influence to the food supply chain, components of the food costs, structure of environment costs of companies in the entire sector of food and beverage retail (500 companies within S&P), meaning of the effective water consumption in the food retail, as well as in waste food treatment. Significant attention, in the context of the afore said is given to the strategies and techniques of the costs control in retail, as an important part of the food supply chain.

Material and methods

Literature treating the research of effect on development and applying the concept of a sustainable development in the food retail is very abundant (Lukic, 2012; Mattison 2013). One part of this literature also describes research on the specificities of the environmental costs in the food retail. All this literature available and used in this paper functions as the startpoint for theoretical, methodical and empiric base for performing an in-depth research of such complex problem: Influence of the environmental costs-ecological costs on their retail food performances.

The Initial *hypothesis* (H1) of this research is : that environmental costs are becoming more and more significant determinant of the entire performances in the food retail. The second *hypothesis* (H2) is in relation with the same is: Implementation of the appropriate strategies and control methods, can in great measure „optimize“ the influence of the environmental costs the performances in the food retail.

Methodology of the hypotheses given is based on the analysis theory, normatives, and especially on the comparative (and) descriptive analysis of the empiric data within the context of the issue researched in this paper.

Empiric data used for this purpose are mainly collected from the literature and web sites.

Results and discussion

In a recent days, the global *growth of expenditures for food and drinks*, has been recorded (USDA: Economic Research Service). Value are varying from country to country. Expenditures for food per capita in 2011 year (calculated in US Dollars) are as follows: USA – 2,329, United Kingdom-2,225, Germany- 2.658, France. 2,263, Slovenia-2,054, Italy-3,276, Japan-3,998, Hungary-1,317, Bulgaria-947, Rumania-1,564, Bosnia and Herzegovina-1,262, Macedonia-1,253 (USDA –Economic Research Service). Consequently, the costs are significantly greater in the developed countries than in the non develeopd countries and countries in trasnsition.

Ecological certificates issuing ,becomes mainstream in the food sector.From the global view ,the *growth of organic food market is becoming a mainstream*. Such food is sold in the conventional shops (available in the supermarket chains), not only in the specialized and other shops. (Brcic-Stipcevic, 2011;Papista, 2012; FiBL-AMI survey 2013, based on national data sources). According to the Symphony IRI Group research, the average prices of goods with a private brandname are 30% lower ,comparing with a natzional brandname.Retail prices are greater at the regular then the „healthy“ products.

At the global level, there is one third loss from the entire food produced for human diet, that is 1,3 billion tons per year (Gustavsson, 2011).*Losses of food* are high both in the industrialized countries and the developing countries, where in the developing countries, more than 40% occurs in the retail sale and consumption(Gustavsson ,2011).

For purpose of optimization, the knowledge of the *costs structure of the food* through the entire supply chain.The figure 1 shows such structure on the example of the USA.

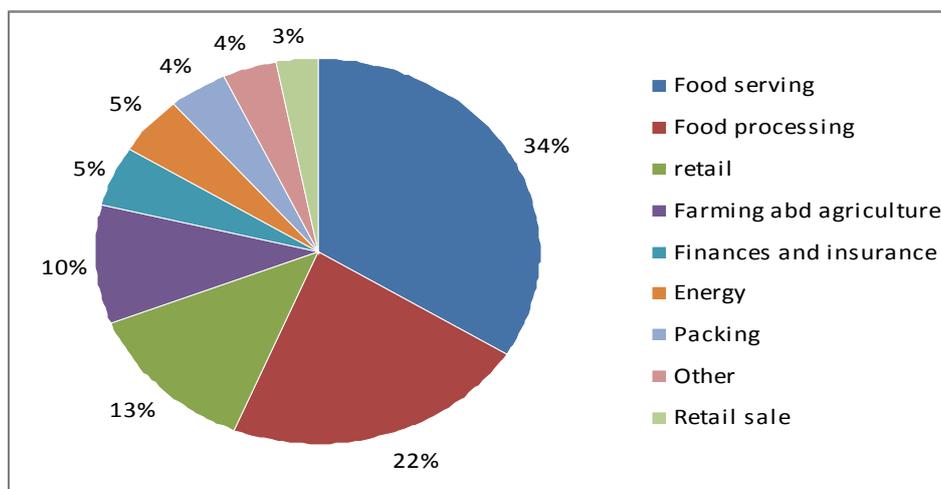


Fig.1 Components of the food costs in the USA in 2011 year

Note: Created by the author

Source : USDA-Economic Research Service

According to the data shown in the Figure 1, costs of retail sale in the USA in 2010 year, participated with 12.8 cents (13%) per one Dollar of the sales price (100%). Participation of the trade costs (wholesale and retail sale) in the retail price differ by the individual categories of the food. For example (in April -13 2013) was 49,2 % for beef and 71,3% of pork (USDA-Economic Research Service).

Significant component of the food costs is the energy.*Energy efficiency* in the food sector is recognized through the supply chain.According to the Earth Policy Institute, consumption of the energy through the food value chain at the following stages is:Agricultural process-21%, food processing-16%, packing-7%, retail sale-4%.Currently, 9% of the total american energy

consumption is used for production, processing and transport of the food.(Foo Miles-the center for Environmental Education, www.ceeonline.org>...>Upload Knowledge).

The leading author of the recently published food study Chris Weber from the Carnegie Mellon University, published by the Environmental Science & Technology, emphasizes that 83% of the greenhouse effect *gas emission* within the chain food value comes from the growing and harvest.Almost all phases of the food value chain are taking significant role in th carbon print.Emission of the greenhouse gas effect (GHG) ,by each phases in the food supply chain is as follows:Agriculture-40%, Fertilizer production-5%, Food producton- 12%, Packing-7%, Transport.12%, Retail sale-7%, catering-6%, in-house consumption-9%, and treatment(removal) and waste-2% (Garnt, 2011).

The food sector in the European Community takes the first place in regard of incooms,with over 8 million empoloyees.*Logistics and chain supply control*, have a significant role in the food sector.Characteristics of the food supply chain differ for countries with the low, medium or highh Gross product (Boye, 2013).

Integrated access to the designing and managing of the food supply chain includes simultaneous quality control, protection, sustainability and logistic efficiency from production and processing of the food, up to the entire food supplying chain,based on the principle „from the farm to the fork“ (Manzini, 2013).

Inclusion of the sustainability in the food supply chain represents on of the significant changes having function of sustainable development realization, as well as growth of all members, including retail sale in 2011 year, the Agency of Enviroment in Europe published facts quoting that food and beverage sector participates in the global resources consumption with 23%, 18 % in the carbon dioxide emission,along with greenhoue effect, sour gases 31% (Manzini, 2013).

Usage of the carbon print shows problems of influence of the food transport in regard of environment.Table 1 shows carbon prints through the life cycle in the milk production.

Table 1. Carbon prints in the milk production through the life cycle phases

Life cycle phases	Raw material production	Production/processing	Logistics/distribution	Retail sale	Usage in production	Recycling and removal
Carbon print	73%	9%	3%	10%	3%	2%

Source: Konieczny, (2013)

Facts in the table above show that carbon prints in the milk retail sale are smaller than those found in production and processing.Carbon prints, however are differ from one food category to other.(Konieczny , 2013).

Food transpot becomes one of more significant sources of the grenhouse gas effect emission.It is quite obvious, due to a fact that 817 million tons of food are transported all over the world.“Food miles“, one of the leading ways for sustainability evaluation, i.e. recognition the environment effect (Paseel, 2013).This term denotes food transport up to the final consumption point.The transport distance growth every year, nowdays it is 1,300 miles.

As regards energy consumption and carbon dioxide emission which products the greenhouse effect, the *transport model* is a factor of influence (Table 2).Energy consumption and carbon dioxide emission which products te greenhouse efefct is the greatest in the air transport, and in same time, thgis emission is the lowest in the international water-container transpoort.A choice of the transport model ,the relative consumption can be optimized.By decreasing the grenhouse gas emission ,positive effect on the climatic changes will be obtained.

Table 2. Influence of the transport model on energy consumption and carbon dioxide emission

	megaJoules per ton-km	Kg CO2 eq per ton-km
International water-container	0,2	0,14
Internal water	0,3	0,21
Railway	0,3	0,18
Truck	2,7	1,8
Air transport	10	6,8

Source: Konieczny ,(2013)

Environment costs in the food and beverage sector as well as in the food retail sector are of great importance. The proofs of such statement is shown through facts given for companies dealing with the retail sale of food and beverage (as part of S&P 500 companies), shown in the Table 3.

Table 3. Components of the environmental costs of the companies within the sector and food and beverage retail sale

Components	Food and bevarage (in billions)	Retail sale (in billions)
Water	\$ 38,398	\$ 8,009
Soil and water polution	\$12,019	\$ 7,409
GHGs	\$ 10,323	\$ 3,110
Air pollution	\$ 7,589	\$ 1,724
Waste	\$ 353	\$ 943
Total	\$ 68,682	\$ 21,195

Source: Mattison, (2013)

The data in the Table above show that environmental costs of the companies in the food and beverage sector are 69 billion US Dollars and 22 billion US Dollars respectively (as a part of 500 S&P companies. Key components of the environmental costs in the Food and beverage sector are , as follows: water consumption (\$ 38 billion), soil and water polution (\$ 12 billion), greenhouse gas effect emission (\$ 10 billion), an air pollution (\$ 8 billion). In regard of the food retail sale , the costs include the following items: Water consumption (\$58 billion), GHG emission (\$ 7 billion). Components of the environment costs are however different for each food category. The water consumption is a significant component of all. Better and average water consumption as the environmental costs components is an opportune solution. In the same time, the uneconomical consumption can only bring a risk (Mattison ,2013).

Benefits gained by reducing food waste through the supply chain are of great importance ,for the entire society from one side, and for each company and any individual ,from the other side. (Erikson, 2012). The Table 4 shows the results of such research.

Table 4. Assessment of the effects of food waste reduction throughout the supply chain in Sweden 2011th and 2012th

Supply chain sector	Waste (tons)	Waste per capita (tons)	Margin benefit for the society in regard of waste reducing (SEK/kg)	Margin benefit for an individual or ecompany in regard of waste reducing (SEK/kg)
Household	67,500	72	81	62
Restaurants and caterings	125,000	13	31	12
Retail sale	39,000	4	25	6
Industry	171,000	18	25	6

Izvor: Eriksson, (2012)

All data from the Table above show obvious benefits of reducing food waste through the entire chain of the food supply, for the society, as well as for an individual, or company. They are more valuable for the society than an individual, or a company (In Store, June 2013, www.instore.rs).

Due to a complex ecological significance, there is a plea for the system of no returnable package, instead of returnable, due to a huge amount of money waste. This is shown in the research carried by Heineken.

Food recycling brings significant benefits. Therefore, recycling rate on the food supply chain members is increased by each year. Empirical results obtained in Japan confirm this statement (Takata, 2012).

Conclusion

This paper stresses viewing of factors, specificity of a structure and effect of the environmental costs to the performances in the retail sale, as a member of the food supply chain.

In such context, it is concluded that the environment costs-ecological costs, make more significant factor of the costs efficiency, as well as for performances in the food retail sale. Their structure within the retail sale is specific in relation to the entire food sector.

Three significant components of the environmental costs in the food retail sale are as follows: Consumption of energy, greenhouse gas emission effect and consumption of water. With an efficient control, „optimization“, of the environmental costs structure, as well as their influence on the performance advancement in the food retail sale, can be significantly controlled.

References

- Anders, S and Ahmad, W (2011), „Private Label and National Brand Pricing and Promotional Strategies in Health Differentiated Product Categories: Canadian Evidence“ 2011 International Congress, August 30-September 2, 2011 Zurich, Switzerland 114223, European Association of Agricultural Economists,
- Banterle, et al.(2013), „Labeling and Sustainability in Food Supply networks“, *British Food Journal*, Vol115, No.5, pp.769-783.
- Boye, J.I. and Arend, Y. (2013), „Current Trends in Green Technologies in Food Production and Processing“, *Food Eng Rev* 5, pp.1-17.
- Brcic-Stipcevic, V. et al. (2011), „Distinction Channels and Characteristics of Organic Food Market, *Business Logistics in Modern Management*, Volume 11, pp. 111-125.
- Eriksson, M. (2012), *Retail Food Wastage a Case Study Approach to Quantities and Causes*, Swedish University of Agricultural Science, Uppsala,
- Garnett T. (2011), „Where are Best Opportunities for Reducing Greenhouse Gas Emissions in the Food System (including the food chain)?“, *Food Policy*, 36, pp.S23-S32.
- Gustavsson, J. (2011), *Global Food loses and Food Waste*, FAO, pp.1-38.
- Infante Amate, J. and González Molina, M. (2013), „Sustainable De-growth“ in Agriculture and Food: an Agro-ecological Perspective on Spanish Agro-food Systems (year 2000), *Journal of Cleaner Production*, 38, pp.27-35.
- Konieczny, P., Dobrucka, R., Mrozcka, R. (2013), „Using Carbon Footprint to Evaluate Environmental Issues of Food Transportation“, *Log Forum*, 9 (1), pp.3-10.
- Lukic, R (2012), „Estimates of Economic Performance of Organic Food Retail Trade“, *Economic Research*, Vol.24, No.3, pp.157-169.
- Lukic, R. (2012), „Sustainable Development of Retail in Serbia“, *Review of International Comparative Management*, Volume13, Issue 4, pp.474-586.

- Manzini, R, and Accorsi, R. (2013), The New Conceptual Framework for Food Supply Chain Assessments, *Journal of Food Engineering*, 115, pp.251/263.
- Mattison, R . (2013), *The True Cost of the S & S P 500 – True Cost of Food & Beverage and Retail Sectors*, Trucost.
- Papista, E. and Krystallis, A. (23 June 2012),“Investigation the Types of Value and Cost of Green Brands:Proposition of a Conceptual Framework“, *J Bud Ethics* DOI 10.1007/s 10551—012-1367-6.
- Takata, M. et al.(2012), „The Effects od Recycling Loops in Food Waste Management in Japan: Based on environmental and economic evaluation of food recycling“, *Science of the totalmEnvironment*, 432, pp-309-317,
- Van Passel, S. (2013), „Food Miles to Assess Sustainability:A Revision“, *Sustainable Development*, 21, pp.1-17.