1.02 Review scientific article = Pregledni znanstveni članek

Organic Waste Management in Canada: Building a Sustainable Circular Economy

Alja Perger

Abstract: North America is a big consumer and consequently a big producer of waste. For the purpose of this project, we were primarily interested in collecting information in North America, focusing on Quebec primarily. The main research question was risen up during the fieldwork and assistance with the Canadian company. It clearly presents the enterprise readiness for obtaining a smart solution on organic/food waste problem. It is believed, how organic/food waste can be a resource of a high value. There is a capacity of creating a new path, where organic/food waste could become the important as plant/field nutrient supply. The circular approach to organic waste management is urgently needed in a way how the organic waste should be reduced and returned as productive resource input into our economy.

The paper presents a new value towards a sustainability process that Canada is building at the moment. It represents the innovative approach, which is highly accepted in some cities in Quebec with the obtained pilot projects and excellent results. This paper is not only a simple research paper, but it is also the very important original innovative document which can be highly used on the level of each municipality, region and federal level.

Keywords: organic waste; recycling; sustainability; circular economy; smart cities

JEL classification: Q56, Q58

Upravljanje z organskimi odpadki v Kanadi: potek vzpostavitve procesa trajnostne krožne ekonomije

Povzetek: Severna Amerika je velik potrošnik in posledično velik proizvajalec odpadkov. Za namen tega projekta nas je predvsem zanimalo zbiranje informacij v Severni Ameriki, s poudarkom na Quebecu. Glavno raziskovalno vprašanje se je povečalo med terenskim delom in pomočjo s kanadskimi podjetji. Predstavlja pripravljenost industrije za pridobitev pametne rešitve problema ekološkega / živilskega odpadka. Verjamemo, kako lahko organski / živilski odpadki pomenijo vir visoke (nove) vrednosti. Obstaja zmogljivost ustvarjanja nove poti, kjer bi organski / živilski odpadki lahko postali pomembni kot oskrba s hranili rastlin in polj. Krožni pristop k ravnanju z organskimi odpadki je nujno potreben tako, da bi bilo treba zmanjšati organske odpadke in jih vrniti kot produktivne vire v naše gospodarstvo.

Prispevek predstavlja novo vrednost za trajnostni proces, ki ga Kanada gradi v tem trenutku. Predstavlja inovativen pristop, ki je v nekaterih mestih v Quebecu zelo dobro sprejet z dobljenimi pilotnimi projekti in odličnimi rezultati. Ta članek ni le preprost znanstveni članek, temveč je tudi zelo pomemben izvirni inovativni dokument, ki se lahko uporablja na ravni vsake občine, regije in zvezne ravni.

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JEL klasifikacija: Q56, Q58

1 Introduction

In the past few years, we could witness a major concern everywhere trying to find a suitable solution to low GHG, especially CO_2. In Europe, the usable solutions for OW[1] are composting and biomethanization.

The main research question was risen up during the fieldwork and assistance with the Canadian company being responsible to present its innovative solution for organic/food waste. It presents clearly the enterprise readiness for obtaining a smart solution on organic/food waste problem. It is questioned *if organic/food waste can be a resource of a high value.* With the knowledge, there is a capacity of creating a new path, where organic/food waste could become the important as plant/field nutrient supply. It will build a recognizable environmental impact through our society.

Doing the project in Quebec, Canada, was not blindly chosen. North America is a big consumer and consequently a big producer of waste. Over the years, a lot of questions have been risen from many different groups (community, municipalities, politicians), how to find a solution for OW - which can bring a positive result in a reasonable time.

All the information we were using were collected by data collection over the past 4 years. This is representing some strong research into some specific habits and behaviour we were evaluating mostly by observation method. We could not use any past descriptive data mostly because the innovative value form which was presented is new and does not exist before. The valuable information was given from the municipality or regional part of the government but mostly we were using the observation method accompanied with regular field-work and social-applicative anthropological methods.

Many researches were showing how almost 40% of food goes into waste. In North America this represents cca. 200kg/per person. Food/organic waste being thrown away, creates a large amount of methane, sulphur dioxide, ammonia and carbon dioxide. If we compare this situation with other waste, the organic/food waste represents the highest percentage. Only 1kg of organic waste produces 3,5kg of methane (60%) and 2, 3 kg of CO2. (40%). Methane is very harmful mostly by affecting the ozone layer (Bureau de Normalisation du Québec, 2005, 2007).

Only in Montreal, organic/food waste represents almost 47% of the waste collected by the city, while only 8% is kept out of landfills. The city urgently needs to divert its organic waste from landfills as required by the Quebec government[2]. There is a high commitment how by 2022 all organic/food waste is planned to be forbidden from landfills. Nevertheless, landfills have a major negative impact on soil, water (especially groundwater) and in the atmosphere.

For the purpose of this project, we were primarily interested in collecting information in North America, focusing primarily on Quebec. Until today, in province of Quebec[3] , there is no known or applicable method of collecting organic waste in a way of transforming it later into a new and reusable sustainable source. This was the main reason why everything started with a very individual market research more than 4 years ago. Being a witness of an implication of brown containers, which again do not show the final sustainable solution for organic/waste problem, as Canada expect in the name of Environmental Act Change. Our innovative method was and still is concluding the following participants such are municipalities, regional boards, individuals – residents.

The research problem was clearly shown. Is Canada and especially Quebec ready to start and to develop its sustainable economy path towards creating a clean and smart environment starting with organic/food waste collecting issue? Organic/food waste has significant environmental, social and economic global implications. Some cities and some pilot projects are open with some excellent results. Their main focus is to encourage the valorisation of food/organic

[1] OW – Organic waste. In this article organic waste is marked as food waste and not as "organic" food (waste) being grown or cultivated organically.

[2] Implementation of the Climate Change Action Plan and the Québec Energy Strategy, and adoption of a development strategy for Québec's environmental and green technology industry, entitled Pour un Québec vert et prospère. 1st of July 2018.

[3] Quebec is the second largest Canadian province, predominantly French speaking province with more than 8 million people in 2017.

waste to reduce the garbage stream. The circular approach to organic waste management is urgently needed in a way how the organic waste should be reduced and returned as productive resource input into our economy.

2 A circular strategy for organics

Every year tonnes of valuable resources leak from our economy and this number has grown dramatically over the last two decades. These resources are the waste, created through our take, make and dispose pattern of consumption – a linear model that treats our resources and energy as limitless and disposal as inexpensive.

According to Statistics Canada[4], every year only Ontarians [5] generate over 12 million tonnes of garbage with over three-quarters of it sent to disposal. Almost 4 million tonnes of this waste is organic which includes an estimated 30 percent of food waste lost along the value chain from farm to fork, or in other terms, $12 billion of food loss every year. All of these lost resources represent a cost to our economy, society, and environment.

A circular approach is needed to organic waste management whereby wastes are reduced and what remains is captured and returned as productive resource inputs into our economy. For organics, this completes the carbon cycle, returning essential nutrients back to the soil for ongoing soil health and fertility. It represents an enormous opportunity to drive value creation through a hierarchical approach to organic waste management as (1) *reducing food waste creation, (2) reusing for human / animal consumption, (3) recycling to enrich and improve soil quality (compost or digestate) and (4) recovering energy.* (Figure **1**).

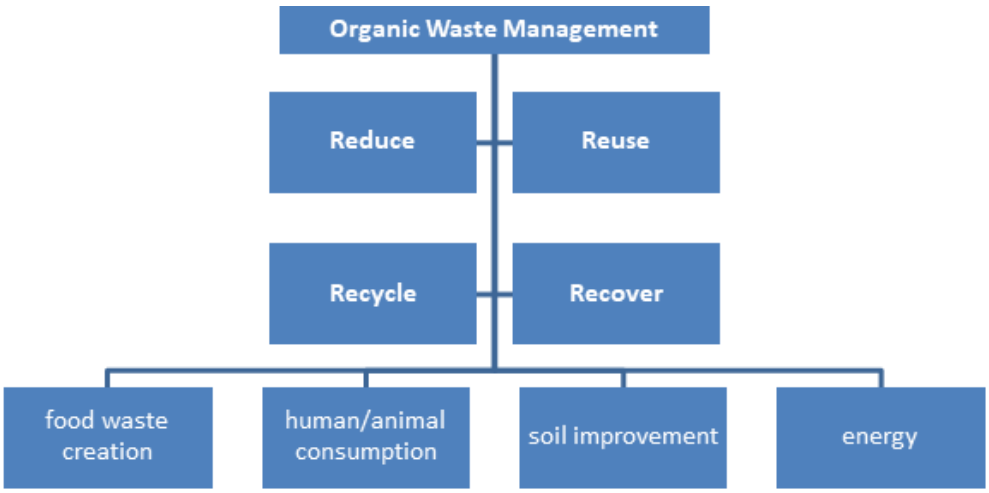

Figure 1 Organic Waste Management. Source: author.

Like recycling and reuse, the proper processing and use of organics, offer tremendous environmental and economic opportunities. From an environmental perspective, using compost as mulch, an amendment to soil or as potting source, it can provide a habitat for beneficial soil fauna and microbes, decrease contaminants, improve water retention and conservation, decrease soil erosion and topsoil loss by improving soil structure, and reduce or eliminate the need for chemical fertilizers.

There is the important link with Climate Change issue where some proper organic waste management can also play a major role in the mitigation of greenhouse gas (GHG) emissions in a number of ways (Figure 2):

(1) Less food waste going to disposal means fewer GHG emissions associated with growing, manufacturing, transporting and disposing of food
(2) Diverting organics from disposal avoids potential methane emissions, even if biogas capture systems are in place
(3) Using the biogas produced from organic wastes as a source of energy reduces the need for fossil fuel energy sources, such as coal, oil and natural gas.

[4] Composting behaviours by Canadian households have increased over the years. Some municipalities have introduced composting programs to increase participation and reduce the amount of waste shipped to landfills.

[5] Ontario is a province in east-central Canada that borders the U.S. and the Great Lakes with 14 million habitants estimated 2017.

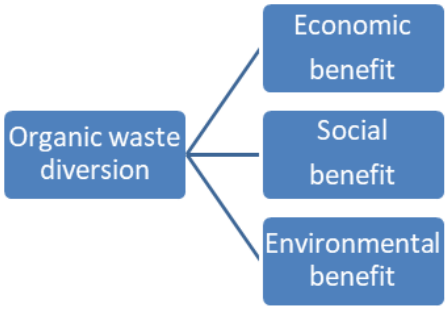

Figure 2: Organic waste diversion (source: author)

Although the diversion of organic wastes from disposal generates substantial economic, social and environmental benefits, disposal predominantly remains the least-cost management option. The true costs and benefits of organics management are not accurately or adequately accounted for in the current economic framework, which leads to unnecessary waste creation and a lack of resource reutilization. A classic example in the agricultural sector is the continued predominance of low-cost peat and inorganic fertilizers. Instead of reutilizing nutrients through compost, digestate or other soil amendments, economic factors make it preferable to use harvested peat and inorganic fertilizers. As the amount of organic waste generated in Ontario continues to increase, the challenge for government is to introduce policies and program hat change this dynamic.

This is not to say progress is not being made. Some ad hoc provincial policies have helped to drive some progress, including requirements for municipal leaf and yard waste programs, reduction of red tape for on-farm anaerobic digesters and feed-in-tariff pricing for biomass facilities. It is however important to note that the piecemeal approach to these policies have created their own set of issues which are still being dealt with.

3 Important research limitations/implications about organic waste problematic

Everywhere is a deep thought being present how using municipal organic waste is one way to achieve a path towards the sustainable cycle. Ideally, we can write about a perfect sustainable circle (Figure 3) when the organic waste is returned mostly to its place of origin. In Quebec, organic waste collection nowadays represents a big political issue and there is no one way decision yet mostly to implicate the individual city how to start. Some of the area follows the concept of biomethanization, while the others are already avoiding it. Third options try to understand the importance of organic waste and the connection with the agricultural sector, but it is important to develop also a legal framework for the use of municipal and industrial organic waste in agriculture.

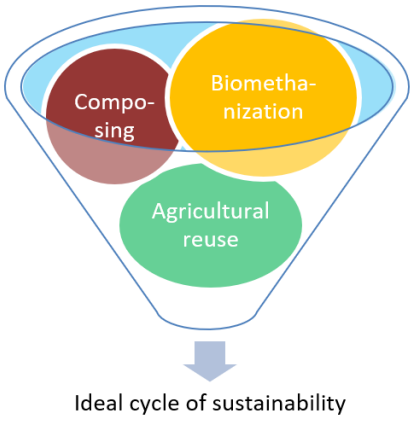

Figure 3: Ideal cycle of sustainability (source: author)

Based on the 4R-D[6], the Québec Residual Materials Management Policy[7] subscribes to sustainable development arising from the idea how things cannot continue as before and that the shortfalls of development models focused solely on

[6] 4R-D: Reduce, Reuse, Recycle, Recover waste – Dispose waste

[7] Québec residual materials management policy. Environment Quality Act, May 2018.

economic growth must be remedied by reconsidering our methods in light of our new priorities. We must aim at economic efficiency to create an innovative, prosperous, and environmentally and socially responsible economy—in short, a green economy (Bureau de Normalisation du Québec, 2007).

The goal of the Québec Residual Materials Management Policy is to implement various measures that not only help improve our environment and help reduce economic losses associated with simple disposal of residual materials, but also foster the growth of the recycling and energy production industries. (Canadian Food Inspection Agency (CFIA). 2011). These measures aim to:

(1) Prevent or reduce the production of residual materials, particularly by targeting the product manufacturing and marketing
(2) Promote recycling and reclamation of residual materials
(3) Reduce the quantity of residual materials sent for disposal and ensure the safe management of disposal sites
(4) Require producers to take into consideration the environmental effects of their products and the costs associated with the recycling, reclamation, and disposal of the residual materials generated by these products

4 Practical and/or social implications

Referring to all the fieldwork being evaluated until now in combination with some regular work and research, analysis, results and discussions with major considered individuals the important and expected impacts on society were created (Federation of Canadian Municipalities, 2009).

(A) Extended landfill life contributes to land preservation;
Diverting organics from landfills preserves space for those wastes that cannot be diverted or reused. Removing organics from landfills reduces leachate and odours nuisances; therefore, decreasing the social negative impacts for surrounding communities and society.

(B) *The development of organic processing facilities and the end-use of fertilizer lead to numerous social benefits*.
Developing facilities closer to the communities in which the organic wastes are generated can encourage better community participation. Facilities that are close to waste sources also reduce transportation requirements, which can also provide environmental health benefits through the reduction of GHG emissions.

(C) It stimulates employment and a new, environment-based economy.
Processing facilities create new jobs during both the construction and operation phases. Fertilizer management supports economic development through employment: handling, marketing, research, demonstration, and education. By providing soil improvement, organics recycling helps sustain agriculture and food production.

There is a need to create the successful implementation through a variety of programs, including community, provincial and federal authorities.

5 Method of Blue Ocean Strategy and organic waste evaluation value need

5.1. Creating Value Innovation

Blue Ocean Strategy (Kim and Mauborgne, 2014) emphasizes on creating the new market space by focusing the growth of market demand and competition divergence in industry. The strategy is no longer focused on competition, but on the value innovation. The innovative value creation is far away from the competition by using a low cost. Value innovation is the first step of the blue ocean strategy that intends to embrace the entire system of company activities. The company's value innovation was directed a whole system to achieve a leap in values for buyers and companies. Value innovation was based on the view of the market limits, and the industries structure were unaccepted for granted but it was reconstructed through the actions and beliefs of businesses, or it was called "reconstruction" (Kim and Mauborgne 2005). The company focused systematically examined the limits competition and reconstruct the elements in different markets to make the level of market demand for new ones that it can be created.

5.2. Create Blue Ocean Strategy within organic waste management

In particular, Kim and Mauborgne (2005) found six approaches to establish the limits of the market, and it is referred to as the six-way framework. The six-way framework was contrary to the key assumptions underlying the strategy in

many companies which makes the companies continue trapped to compete in the red ocean. Inside our work it was mostly used some usable framework to show the best strategy for the sustainability inside organic waste management process. It was chosen as the priority before creating the knowledgeable approach towards organic waste solution at the large scale (Kim and Mauborgne, 2014).

(A) The alternative industry in organic/food waste projections

A company was not only to compete with the other companies in the same industry, but the company competes with the companies that produce the more alternative of products or services. Alternative products include the products or services that have the different function and form, but they have the same goals. Alternative products understanding of the broader than substitutes. The substitution of products or services has different forms, but they offer the same function or core utility.

Inside the organic/food waste projections there is a discovered process where the decrease of GHG has to be hugely visible and at the same time the creation of a new product, from reusable material could be provided.

(B) A strategic role in the industry in organic/food waste projections

The primary key for creating a blue ocean in across strategic groups which meant to break the narrow horizons (tunnel vision) with how to understand the factors that determine the consumer's decision to move up or down from one group to another group.

Inside the organic/food waste projections there is a model where residents are actually creating the major sustainable awareness and breaking the narrow understanding following big political decisions. Every serious company at the moment following our verified data is concerned about the consumer volume understanding.

To reconstruct the importance of organic/food waste management in Canada it is necessary to present our findings using our observative method and cooperation with some important players in the systematic up gradation. The following four step framework was presented and accepted by some major companies who are dealing with the important decision of Canadian government of banning the landfills in 2020. The frameworks were used as follows:

Eliminate

To eliminate the factors that are considered standard and accepted by the industry. The aim is to see beyond the scope of business opportunities that have been created previously. In the case of organic/food waste management in Canada this factor showed the importance of eliminating the process of biomethanization in several places. The process of biomethanization, even being mostly everywhere the first thought through the past, was not considered as being the very wise decision. Especially where more deep concerns are being awaken about separation and recycling and reusage of material.

Reduce

Focusing only on organic/food waste problematic, the *reduce* factor is named to reduce the organic/food waste at its source. Mainly here the role of residents has to been included. Many unanswered issues are taken with it, which local and federal government sometimes do not answer properly or at least understandable for the public ear. It should be known that the *reduce* factor cannot be only provided at the last stage of treating organic/food waste material the latest should become only the additional process. The main start begins at the source, at the tipping point, where each individual can or want to reduce its food consummation, especially focusing to obtain and understand the correct and proper disposal.

Raise

To raise the importance and personal awareness how to treat organic/food waste properly has to done with the symbiosis between the named industry and the user. To raise the awareness and create the tipping point, why it is important to recycle organic/food waste and as well to create the main circular understanding of the whole process.

Create

To create the factors had never offered industry previously. Through the creation of a new factor, the companies can find the new source for buyers and create the new demand also provide the industry's strategic price. Organic waste management is ready to understand still the new level inside the waste management industry. To create a new usable

product this has been invented as the product of the whole different process, where re-usage means the first step towards the sustainable thinking in the industrial world.

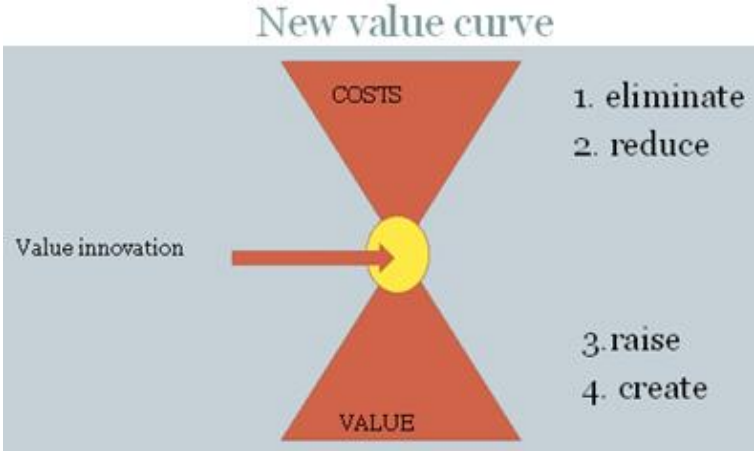

Figure 4: Kim and Mauborgne, 2014; author

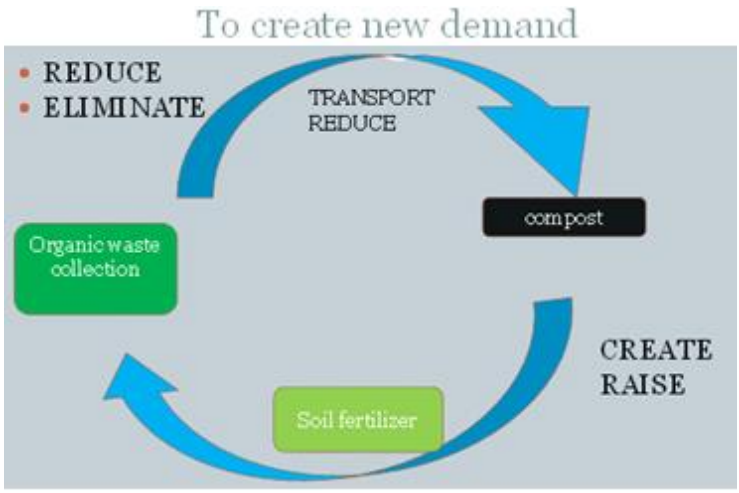

Figure 5: Kim and Mauborgne, 2005; author

6 Discussion

Through some major work, data collection, fieldworks and research process, some important findings can be put up front. Not only to be captured in theory but as well being used as the tool for some major decision in this field. Using the process of blue ocean strategy showed some important principles which need to be reconsidered again. Results being capable to capture are important for Canada and its organic/food waste management. A new value curve is created. To start a new thinking, this is sometimes very critical and hard to convince, especially to some old business companies following their business model which needs to be refreshed especially with the subject on organic/food waste management.

Results are hugely connected into a broader spectre. Each province in Canada needs to focus building the solution about organic/food waste management. Inside each province many different priorities create the local, municipal decisions which are again totally under some strong supervision of regional municipal environments. To introduce them, the need about creating the importance of circular economy towards the sustainable environment it has to be written immediately.

Here is still the main reason in less education regarding this subject. There is still not enough data and crucial information, where and why the organic/food waste has to find place in the second largest country in the world. Often we find some contradictions mostly at the political level. Being so, it is totally understandable how the residential population has no data, knowledge, well established models how to start, how to continue and how to manage something that is already treated as being done through many political discussions and decisions.

It is true how creating a new model in the human behaviour, especially in era where we think we "know" almost everything and the "model kit" for organic/food awareness is not far, it is quite impossible to believe how the main solution for organic/food waste is still lost. Lost in its correct understanding of this matter. Far away from the ideal creation of understanding what the sustainable economy should mean. Far away from the ideal city model how to implement the green economy everywhere. There is only one missing-link here and this is the first step where each individual should understand its own role in all this, where each step he makes towards the sustainable circular economy counts.

7 Conclusion

Although food is essential for life and organic materials are critical for healthy soils, significant amounts of organic material end up going to disposal. There is growing recognition, both domestically and globally, that food waste is a growing problem and current practices are not sustainable. There are serious environmental consequences to sending food and organic materials to disposal. When these valuable materials end up in a landfill, they contribute to climate change. As food and organic materials break down in an oxygen-deprived environment, they create methane, a potent greenhouse gas with a global warming potential 25 times greater than carbon dioxide (CO2) over 100 years and 86times over 20 years (The Compost Council of Canada, Composting Processing Technologies, 2006; Environment Canada, Estimation of the effects of various municipal waste management strategies on greenhouse gas emissions, 1995).

There are other environmental benefits in diverting food and organic wastes from the disposal stream beyond greenhouse gas reductions. These benefits include creating products such as compost and digestate, which can improve soil health when applied appropriately, help reduce erosion, and improve water quality (The Compost Council of Canada, Composting Processing Technologies, 2006). Similarly, renewable natural gas and biofuels can be produced from diverted organic material and their use can help reduce our dependence on greenhouse gas-intensive fossil fuels. Turning food and organic waste into valuable products creates economic and environmental benefit s of recovering nutrients, energy and other resources to serve as inputs into new products (Clarke, 2000).

The issue of food and organic waste is complex and involves a number of sectors across the supply chain. Addressing food and organic wastes will require coordinated action among many players across multiple sectors. It will also require the right regulatory and incentive structure. Municipalities, the waste management industry, producers, non-governmental organizations, the agri-food industry (e.g. farmers, food processors) and generators of organic waste in the IC&I sectors (e.g., food retailers, restaurants), the government and members of the public all have a role to play. Reducing the amount of food and organic waste ending up in Canada's disposal stream will require the continuing multiple actions by many organizations (Federation of Canadian Municipalities, 2009).

Finally, a larger context is shown here namely because Canada has the world's worst organic/food waste problem. Many different solutions have been circulating in between but no serious decision has been yet done. What is even more necessary to highlight is how the report, which was released by the Commission for Environmental Cooperation — an environmental agency set up under the North American Free Trade Agreement — is showing when including all stages of the food supply chain, how almost 400 kilograms of food per capita is wasted in Canada every year. It has to be mentioned and suggested how in the future further research should take place, considering residential cultural habits and being aware as the sustainable consumer. This type of research should be done by each municipality, following their needs of creating their own sustainable cycle, being important for their residents and taxpayers.

Organic/food waste management has to take its place first in each individual that it can be spread as the mutual and largely important cultural positive aspect.

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