

Evaluating the reduction effect of Food Loss and Waste initiatives in the bio-food supply chain

Cloutier, Jacinthe, Laval University¹
Afif, Karima, Laval University²
Roy, Marie-Claude, Laval University³

In Quebec, numerous initiatives have been undertaken by various stakeholders to reduce food loss and waste (FLW) in the bio-food supply chain. However, very little is known about their effectiveness in reducing the FLW and even less about their sectoral impacts. The main research objective of this project is to investigate how the organizations operating at different levels of the bio-food supply chain evaluate the reduction effect of these FLW initiatives. An exploratory approach is adopted to identify the indicators employed as well as the impacts that the FLW initiatives generate at different supply chain levels. This research will support the development of improved initiatives by recommending more efficient methods and indicators that would reinforce the reduction effect of the FLW initiatives.

In a recent study, Cloutier and Roy (2021) have emphasized the importance of maintaining communication between stakeholders in the bio-food supply chain to optimize the FLW reduction efforts. The main result of this study is to ensure harmonizing the actions carried out by the stakeholders in the bio-food supply chain, considering the perspective of each one of them. This approach helps incentivizing these stakeholders to undertake behavioural changes, since they are better integrated in the process. This research helps better evaluating the reduction effect of the FLW initiatives that have been implemented across the bio-food supply chain.

Several initiatives aiming the FLW reduction have been taken in different countries. At the government level, legislative measures have been proposed, adapted, or adopted to help reinforcing the FLW reduction (e.g., Quebec National Assembly, 2020; Ministry of Agriculture and Food - Republic of France, 2020). In the hotel, restaurant, and institutional sector, other initiatives have emerged such as the use of suboptimal foods on restaurant menus (van Rassel, 2019), the selling price reduction for foodstuffs approaching their expiry date at the retail level (Aschemann-Witzel et al., 2017; Aschemann-Witzel et al., 2018; Cicatello et al., 2019; Rohm et al., 2017) or adopting practices that are more responsive to inpatient appetite preferences (Dias-Ferreira et al., 2015). However, many of these initiatives are in their infancy, and few of them have not been evaluated or have disputed results regarding the FLW reduction effect of these initiatives.

This research is carried out in two main stages, namely a questionnaire survey followed by a qualitative study based on focus groups. To develop our survey questionnaire to assess the reduction effect of the FLW initiatives, an exhaustive literature review and expert consultations have been conducted. Six experts (value chain management, *Ministère de l'Environnement, de la Lutte contre les changements climatiques, de la Faune et des Parcs*, *Ministère de l'Agriculture, des Pêcheries et de l'Alimentation du Québec*, sustainable transformation of the food value chain, food bank administrator, and academic research in FLW) suggested improvements to the questionnaire developed following the literature review. The final questionnaire consists of 30 questions including 21 open-ended. This choice is justified by the fact that very little is known about how to evaluate the effectiveness of the FLW initiatives. Data collection is still ongoing. This survey approach will be followed by focus groups to develop an in-depth understanding of the underlying relationships between stakeholders in the bio-food supply chain.

Results show that most respondents are from community-based organizations. The different supply chain levels are covered in the study including for instance suppliers, manufacturers, distributors, retailers as well as consumers. We have noticed that the tools employed to assess the effectiveness of the FLW initiatives are varied, including for example satisfaction surveys, tables accounting for harvests, participation, deliveries, pick-ups that took place, participating members, number of neighborhoods and beneficiaries served, weighing of saved and shared fruits and vegetables, etc. An interesting fact, the

¹ Cloutier, Jacinthe (jacinthe.cloutier@fsaa.ulaval.ca), Associate Professor, Department of Agricultural Economics and Consumer Sciences

² Afif, Karima (karima.afif@fsaa.ulaval.ca), Assistant Professor, Department of Agricultural Economics and Consumer Sciences

³ Roy, Marie-Claude (marie-claude.roy@fsaa.ulaval.ca), Research Professional, Department of Agricultural Economics and Consumer Sciences

benefits of these initiatives extend over and above the reduction of FLW, allowing the mobilization of citizens, increasing the visibility of farmers or local businesses, helping food banks to offer fresh foodstuffs, breaking the isolation of certain volunteer-pickers and incentivizing balanced diet. Table 1 shows the negative and positive aspects of implementing FLW initiatives.

Table 1. Strengths and weaknesses of the implementation of the FLW initiatives

	Strengths	Weaknesses
Finances	<ul style="list-style-type: none"> • Low costs for donors • Funders presence • Funding • Access to infrastructure 	<ul style="list-style-type: none"> • Difficult to find or access funding • Few revenues generated • Expensive investment • Low wages • Inflation • Lack of accessible infrastructure
Human Resources	<ul style="list-style-type: none"> • Partnerships and collaborations • Shared vision of the project • Mobilization, commitment and satisfaction of volunteers, employees, citizens, businesses, and other organizations • Management support • Sensitization to healthy alimentation, to local producers, to FLW initiatives • Breaks social isolation • Increase in the number of families accessing fresh F&V • Communications 	<ul style="list-style-type: none"> • Trust in partners or participants • Difficulties in agreeing on the orientations • Finding and paying for specialized resources • Labour shortage • Recruiting volunteers • Constant sensitization and motivation of employees, merchants and the general public • Employee and volunteer retention • Work in silos
Management	<ul style="list-style-type: none"> • Data showing the impact of the initiative • Improved business visibility 	<ul style="list-style-type: none"> • Commercialisation • Governance and accountability • Projected image (marketing) • Data collection to monitor the initiative • FLW reduction target not met
Distribution	<ul style="list-style-type: none"> • Easy-to-implement initiatives • Efficient distribution network 	<ul style="list-style-type: none"> • Processes specific to the materials used (food waste) • Transport, stocking, used of personal cars • Several organizations collecting from the same donors
Law	n/a	<ul style="list-style-type: none"> • Efforts to obtain a certification • Legal constraints • Lack of information on laws and regulations
Other	<ul style="list-style-type: none"> • Science that helps understand FLW behavior 	<ul style="list-style-type: none"> • COVID-19

However, many barriers to the implementation of these initiatives have been noticed, for instance the difficulty to be well known within citizens, important shortages of volunteers as well as the lack of economic incentives to maintain the long-term engagement of firms. Despite these barriers, respondents are motivated to continue their project and tend generally to be ambitious in terms of implementing the necessary adjustments, as the case may be.

This exploratory study aims to explore how to evaluate the reduction effect of the FLW initiatives that have been implemented in the bio-food supply chain. Although several firms have considered including performance indicators, our study emphasized that the indicators employed are not uniform, vary significantly across the different supply chain levels, and their implementation is not systematic at the outset of the initiative. The social benefits observed may be used as an argument to prompt government bodies to provide more support to firms aiming to implement such initiatives.

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