

The Impact of Food Safety Regulations and Standards on Food Loss and Waste in the Fresh Produce Sector in Canada

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Introduction/Background

Following the expiry of the Millennium Development Goals in 2015, the United Nations General Assembly adopted a new set of goals, titled the Sustainable Development Goals, with the aim to reduce poverty, protect the planet and ensure prosperity for all.¹ Among these targets, Sustainable Development Goal 12.3 sets out to halve per capita food waste worldwide at all levels of the production chain, that is to say from farm to fork, by 2030.²

It is estimated that in North America alone, over 170 million tonnes of food intended for human consumption is lost or wasted annually.³ While the majority of food waste in Canada occurs at the consumer level due to over purchasing and inadequate understanding of best before dates, a large portion of food loss and waste occurs over the course of the food production chain. Though the responsibility for these losses is shared by multiple actors throughout the food chain, the impact of food safety regulations and industry-led guidelines has not been thoroughly investigated. The aim of this report is to highlight the important federal food safety regulations and voluntary guidelines which may play a role in the creation of avoidable food loss and waste (FLW) in Canada, and provide recommendations for future interventions. Due to the diversity of regulations and guidelines across different types of food in Canada, the fresh produce sector was chosen as the subject of this report.

Food Loss and Waste

While the terms food loss and food waste do have some overlap, in the context of food production and sustainability they have very distinct meanings. Food loss refers to the loss of food intended for human consumption due to inefficiencies of the food production or supply chain. This terminology encompasses food loss as a result of improper transport and storage conditions, or food that is left to rot in the fields because it is deemed unfit for sale.⁴ On the other hand, food waste refers to food intended for human consumption being lost due to intentional behaviours. Such behaviour may include overproduction and overpurchasing of foods, excessive portion sizes, and any other behaviour that results in food being discarded when it would otherwise have been fit for consumption.⁴ While food loss occurs over the course of the production chain, food waste can occur at any point from farm to fork, including in large part, at the consumer level.

The United States Environmental Protection Agency has defined a food recovery hierarchy in order to provide guidance with regards to actions food producers can take to reduce food loss and waste. The hierarchy suggests five main alternatives to discarding food in landfills, from most preferred to least preferred: Source reduction, feeding hungry people, animal feed, industrial uses and composting.⁵ The most preferred method of reducing FLW is source reduction, which means reducing the amount of excess food produced at the source, to reduce the potential for FLW downstream due to overproduction and overpurchasing of food. The next action in the hierarchy involves diverting unsold foods to feeding humans, either by donating unused portions to shelters, food banks and other organizations or by selling them at a heavily discounted rate to ensure they are used. Third, food scraps and unused foods can be diverted to the production of animal feed, though this cannot be applied to all types of food, as regulations concerning animal feed can differ by country. Industrial uses of discarded foods can include anaerobic digestion of foods to produce biogas and soil amendment which can be used to aid in the production of more food. The final alternative to landfill disposal of discarded food is compost, which can be used to enrich soil for future food crop harvests.⁵

Based on currently available information, some of the main sources of food loss and waste along the food chain include:

- Inadequate storage conditions
- Crops rejected due to physical appearance
- Damage during transport
- Greater production compared to the demand (unsold food ends up wasted)
- Inappropriate or inadequate processes for handling food
- Weather events affecting crop quality
- Contamination of food along the value chain ^{6 7 8 9}

Food Loss and Waste Reduction Initiatives in Canada

There are currently no federal regulations which specifically address the issue of food loss and waste in Canada, but a number of initiatives are underway in the private and non-profit sectors. Among these initiatives are corporate policies on food loss and waste reduction in the food retail sector, and non-profit organizations such as Second Harvest, which partners with food businesses in Ontario to rescue unsold food and distribute it to local food banks.¹⁰

A private member's bill was proposed in 2016 by NDP MP Ruth Ellen Brosseau. Bill C-231, the *Fight against Food Waste Act* proposed the establishment of a National Food Waste Awareness Day and the development of a Canada-wide strategy to combat food waste, which would include consultations with stakeholders and consumers. ¹¹ Unfortunately, the proposed bill was defeated in October 2016 at its second reading.

International Food Loss and Waste Reduction Initiatives

The French government in recent years has been a worldwide leader in the fight against food loss and waste, with the 2015 release of its proposal for a national policy against food waste. ¹² The original report, "Fighting Food Waste: Proposals for a Public Policy," begins by outlining the responsibilities of all stakeholders, including consumers, producers, distributors, retailers and government in the fight against food loss and waste. Among the proposals were the following:

- Establishment of a national agency against food waste
- Legally mandating donation of unsold foods
- Creation of a zero-waste certification program
- Creation of dedicated mechanisms to handle production crises

In 2015, the French government passed the Grenelle law, which bans grocery stores from throwing out edible food which they no longer deem suitable for sale. Grocery stores must sign contracts with charitable organizations to organize donation of unsold food, and penalties will be imposed upon those who do not donate excess food. Since its adoption, the law has increased donations to charitable food organizations by 22%. In 2018, a proposed bill would extend the law to restaurants and the agri-food industry. ¹³

Following France's example, the Italian parliament passed a similar law in 2016.¹⁴ In Italy, rather than imposing sanctions for food waste, the government offers tax incentives for donations of unsold foods, and has removed penalties for donating food past its "best before" date. The tax rebates are proportional to the amount of food a business donates, and donations are recorded on a monthly basis.

In order to tackle the issue of food waste, the European Commission has included food waste prevention in its 2015 Action Plan for the Circular Economy.¹⁵ In this plan, the Commission has committed to develop a standardized methodology for measuring food loss and waste across the value chain and to take measures to identify points in European legislation which may contribute to food loss and waste such as regulations on animal feed, food donation and best before dates. In April 2018, the European parliament introduced a law that would require all member states to report yearly on food waste levels in their countries, and to provide incentives for the collection and redistribution of unsold food.¹⁶

The G20 Meeting of Agricultural Chief Scientists (MACS) in 2015 emphasized the importance of using science and technology to control food loss and waste across the value chain. As a result, the Global Food Loss and Waste Research Platform was created for researchers from G20 countries to share information on current research on food loss and waste.¹⁷ The goal is to combine research findings, innovative technologies and education campaigns to achieve tangible solutions for reducing food loss and waste.¹⁸

While the passing of these laws shows an international interest in the reduction of food loss and waste, none of these have examined how food safety standards may contribute to increased food loss and waste. This analysis will focus on determining the impact of Canadian food safety regulations and industry-led voluntary standards on food loss and waste in the fresh fruit and vegetable sector. Food safety is a priority for the federal government and the food industry. It is therefore important to first understand the legal structures which govern food safety in order to propose modifications where improvements can be made without compromising the health and safety of Canadians.

Food Safety in Canada

In Canada, food safety is deemed a responsibility shared by all. While federal and provincial agencies do set out minimum food safety requirements, industry and consumers are also responsible for ensuring the safe production, handling and preparation of foods.

Mandatory Regulations and Practices

A number of government organizations are responsible for the safeguarding of the Canadian food supply. Health Canada, in collaboration with governments, industry, and consumers, sets out the policies, regulations and standards with regards to the safety and nutritional quality of foods in Canada, while the Canadian Food Inspection Agency (CFIA) is the regulatory body responsible of the enforcement of these policies.¹⁹ Food safety regulations set out standards for production facilities, microbial and chemical contamination, allergen content, and food labelling practices, among others. Provincial and territorial governments in Canada do enforce their own set of food safety standards which may at times be more stringent than federal regulations. However, the focus of this analysis will be on the federal food safety regulations.

Food and Drugs Act/Regulations

The *Food and Drugs Act and Regulations*, developed by Health Canada, set out the basic requirements for the safety of food, drugs and cosmetics sold in Canada. The Canadian Food Inspection Agency is responsible for the enforcement of the portions of the Act and Regulations as they relate to food.²⁰ Some of the key elements of the regulations as they relate to food

include standards for composition and identity of foods, maximum chemical residue limits, food additives, and food packaging materials.

Fresh Fruit and Vegetable Regulations

The *Fresh Fruit and Vegetable Regulations (FFVR)* were published in 1965 under the authority of the *Canada Agricultural Products Act*. Currently, the *FFVR* are administered and enforced by the Canadian Food Inspection Agency. The regulations set out the requirements for grading, safety, packing and marking of fresh fruits and vegetables produced and imported into Canada.²¹ The *Fresh Fruit and Vegetable Regulations* will be replaced by the *Safe Food for Canadians Regulations (SFCR)* as of January 2019.

The *FFVR* set out the requirements for the appearance, packaging, labelling, transport, storage and safe handling of fresh fruits and vegetables produced and imported in Canada. In terms of food loss and waste, the most relevant requirements in the *FFVR* are those which set out the standards for appearance and disposal of fresh fruits and vegetables. The *FFVR* grading standards score fresh fruits and vegetables based on their appearance. Two types of defects apply against the grade of a product: permanent defects and condition defects. Permanent defects refer to unchangeable or non-progressive traits such as size, colour, shape or insect injury. Condition defects, on the other hand, refer to factors which are progressive in nature, such as decay, moulding, bruising or sprouting.²² Examples of produce grading requirements include the need for cucumbers to be “practically straight, not more than very slightly constricted and not more than moderately tapered or pointed”, and specifications for the colour and size of most fruits and vegetables. The *FFVR* do not contain any specifications related directly to food loss and waste, but the regulations do allow food that is contaminated along the food chain to be repurposed as animal feed, provided that it is fit for this purpose, labelled as such, and prepared separately from food intended for human consumption.

Safe Food for Canadians Act/Regulations

The *Safe Food for Canadians Act* was adopted by the Canadian Senate on October 7, 2012. This new piece of legislation, which is to be administered and enforced by the CFIA, consolidates the mandates of the *Fish Inspection Act*, the *Canada Agricultural Products Act*, the *Meat Inspection Act*, and the food provisions of the *Consumer Packaging and Labelling Act*.²³ Published on June 13, 2018, the *Safe Food for Canadians Regulations* will be gradually phased in over the course of three years starting on January 15, 2019. These regulations will replace the existing *Fresh Fruits and Vegetables Regulations*, and all other regulations under the aforementioned acts. By consolidating a set of acts and regulations each written at different times, the *SFCA* and *SFCR* will provide consistency in industry requirements. In addition, the new requirements set out to align Canada’s food safety system with that of some of our most important trading partners, including the United States. The *SFCR* as they relate to the labelling and grading of fresh fruits and vegetables, will remain essentially the same by incorporating the *Canada Grade Compendium* by reference into the regulations.²⁴

The *SFCR* will place an emphasis on outcomes rather than processes, which is to say that the regulations stipulate *what* the processes need to achieve in order to maintain food safety and comply with regulations, rather than *how* it needs to be achieved. Businesses that prepare food for import or export across provincial and territorial borders will be required to develop their own preventative control plans to mitigate food safety risks and comply with the regulations. These plans will outline any perceived risks and include a plan to address any risks to food safety,

including enhanced requirements for traceability of food in the event of a food safety recall. In addition, the SFCR will also incorporate the existing grading standards for fresh fruits and vegetables.

Voluntary Guidelines and Private Standards

In addition to the mandatory federal regulations and standards, industry members may choose to adhere to sets of voluntary guidelines provided by the federal government, as well as a number of privately regulated food safety certification systems.

In recent years, there has been a rise in the use of private certifications and food safety standards in industry. This can be attributed to a number of factors, including businesses' desire to set themselves apart in a competitive market and increased consumer concerns about food safety.²⁵ These concerns have been addressed at both the private and public sector levels, leading to modernization of food safety regulations. The CFIA allows the use of private food certification schemes provided that their intent is not to replace or supersede the federal guidelines.

Where the federal standards are often “outcome-based”, some private standards are more prescriptive in nature. Industry members may choose to adopt private standards which are more stringent than public regulations to ensure compliance with the regulations. Adoption of these standards is a way for businesses to position themselves favourably in a competitive food market, particularly at the international level.²⁵ Additionally, retail chains or food production firms may have incentives to adopt private standards where the federal standards are missing or inadequate.²⁵ Many major food retailers require that all of their upstream suppliers adhere to a set of private national, international or company-specific standards. These standards are enforced via audits conducted by the certifying body at regular or random intervals.

The Canadian Food Inspection Agency's Voluntary Guidelines

Voluntary guidelines provide generic guidance on how to design, develop and implement effective preventive food safety control systems in order to comply with federal regulations. As the federal food safety regulations are outcome-based, the CFIA's voluntary guidelines provide specific examples of how to accomplish the desired outcome. Examples of CFIA-provided voluntary guidelines for industry include the *Guide to Food Safety*, the *Commodity-Specific Food Safety Guidance Documents* and the *General Principles of Food Hygiene, Composition and Labelling*. The latter two documents were primarily designed for businesses handling foods in the non-federally registered sector, which includes alcoholic beverages, infant foods, bakery products and cereal products. The *Guide to Food Safety*, however, can be applied to both the federally registered and non-federally registered sectors, including fresh fruits and vegetables.

Guide to Food Safety

The *Guide to Food Safety* provides guidance on how to design, develop and implement effective preventive food safety control systems to the Canadian food production industry.²⁶ It is not designed to replace or supersede any existing federal and provincial requirements, but simply to assist in the building of preventative food safety systems by Canadian food producers and handlers. Where regulations provide outcome-based measures, the *Guide to Food Safety* provides more specific suggestions to ensure the outcomes are met. For example, while the regulations call for temperature to be “controlled appropriately during transportation”, the

guidelines suggest products requiring refrigeration be kept at less than 4°C but not frozen while frozen products should be kept below 0°C. The guidelines also suggest models for rotation of stock to prevent losses along the food chain. These specific recommendations, if applied, may actually help reduce the potential for food loss and waste. However, due to the outcome-based nature of the regulations, producers and processors are not required by law to follow these specific guidelines.

Collective International Guidelines

Globalisation has transformed global agri-food markets with food supply chains now increasingly extending beyond geopolitical borders. With legislation in developed countries setting increasingly strict standards for imported foods, food production businesses have been driven to develop their own standards which go above national boundaries. These standards ensure companies can access global markets and offer a product of competitive quality.²⁷ Collective international food safety standards are private standards designed and applied globally, and are benchmarked against the Global Food Safety Initiative.²⁸

Global Food Safety Initiative

The Global Food Safety Initiative (GFSI) “brings together key actors of the food industry to collaboratively drive continuous improvement in food safety management systems around the world”.²⁹ Founded in 2000 by food industry leaders, GFSI was created to address the issue of food safety as a collective, and find collaborative solutions to ensure a safe food supply for all. The GFSI community is comprised of food safety experts from industry, international organizations, academia, and governments from around the world. The GFSI manuals set out the requirements for GFSI-benchmarked food safety certification programs. Food safety certification programs are then assessed against these benchmarks by an independent benchmarking committee to determine GFSI recognition.³⁰

GlobalGAP

GlobalGAP was created in Europe in 1997 under the name EUREPGAP as a retailer-led initiative to harmonize their standards and procedures by developing a Good Agricultural Practice (GAP) manual and certification system. GlobalGAP sets out requirements for food safety and traceability, workers’ health safety and welfare, animal welfare as well as Integrated Crop Management (ICM), Integrated Pest Control (IPC), Quality Management System (QMS), and Hazard Analysis and Critical Control Points (HACCP). GlobalGAP also addresses issues of environmental sustainability by including directives on water and land use. They do not, however, directly address the issue of food loss and waste in the food production chain.

Safe Quality Food Program

The Safe Quality Food Program (SQF) is a GFSI-recognized food safety certification program administered by the Food Marketing Institute. The SQF program provides standards and recommendations for general food safety practices, primary food production, food manufacturing, packaging, storage, distribution and retail. Additionally, it provides a set of standards for food quality.³¹ The SQF operates a compliance and integrity program, ensuring the consistent application of SQF standards to meet stakeholder expectations.

Collective National Guidelines

Collective national food safety standards are private food safety standards designed and applied by sector and industry groups within Canada.²⁸ One of the major food safety certification programs in Canada is CanadaGAP.

CanadaGAP

CanadaGAP is a GFSI-benchmarked food safety program for producers, distributors and retailers of fresh fruits and vegetables in Canada.²⁹ Two manuals were developed by the Canadian Horticulture Council (CHC) in 2008 to provide guidance on safe greenhouse operations, Good Agricultural Practices (GAP), and safe fruit and vegetable operations. They cover the production, packing, repacking, storage, wholesaling and brokerage of horticultural products. As of 2012, all CanadaGAP materials are developed by CanAgPlus.

CanadaGAP requirements are more prescriptive in nature than the federal requirements. While the requirements remain relatively general to allow for some flexibility in processes, the manual does often provide a number of options to achieve the desired outcome, and the manufacturer has the freedom to select any of the offered options via a checklist. CanadaGAP also provides recommendations on handling produce and how to respond in the event of a deviation of process, although considerations for reducing food loss and waste and diversion from landfill are not included in the manuals.

CanadaGAP is one of 17 industry organizations currently recognized by the CFIA's Food Safety Recognition Program (FSRP). Recognition by the FSRP acknowledges that a food safety program has been designed in line with internationally accepted food safety standards and federal, provincial and territorial legislation, and that a food safety management system has been implemented. CanadaGAP is the only organization dealing specifically with fresh fruits and vegetables to have received this recognition.³²

Inter-Company Guidelines

Inter-company food safety standards are developed by individual companies and applied to their suppliers and distributors.²⁸ These standards are often set by large food retailers (Loblaw, Metro, Walmart, etc.) to ensure the quality and safety of their final product. These additional standards can include testing requirements, traceability requirements, transport requirements, and will often be process-based, indicating *how* certain processes must be conducted. Inter-company standards are very specific to the company designing them, and can vary widely between companies. Often, businesses will have requirements that are additional to national or international standards to meet the needs of their company. This increases the need for audits to be performed to ensure compliance not only with national or international standards, but also with any company-specific guidelines.²⁸ Some major retailers include considerations for donation of unsold products in their vendor operating standards, but more information on these business practices is usually found in their corporate social responsibility report.

Methodology

The objective of this study was to paint a picture of existing food safety standards in Canada from both the private and public sectors and to determine whether the enforcement or

interpretation of these standards may result in avoidable food loss and waste, and to provide recommendations for potential future interventions.

The first phase of this project consisted of a review of publicly available literature on food loss and waste and food safety standards in Canada. The aim of this literature review was to provide an overview of the regulatory and voluntary programs, standards, and guidelines that relate to fresh produce in Canada, and assess how the application of these programs may result in food loss and waste. Publications from academic journals, federal agencies, and the private sector were considered in this review to understand how food safety policy is operationalized in Canada at various levels of government and in the private sector.

A side-by-side comparison of federal food safety regulations and industry and third-party certification guidelines was conducted to understand the interaction between public and private standards, and to identify key points where food loss and waste may occur along the value chain as a result of these requirements. Points were identified as potentially contributing to food loss and waste if their implementation may result in food that is otherwise fit for human consumption being discarded at any level along the value chain. Edible food being sent for composting and animal feed, both considered superior options to landfill disposal, is still considered wasted, while food sent to food rescue organizations, for transformation, or for donation is not.

Finally, stakeholder interviews were conducted in order to better understand any possible connections between food safety policies and food loss and waste in the fresh fruit and vegetable sector, and to clarify the operationalization of relevant food safety policies. Members from federal agencies, fruit and vegetable growers associations, third party certification associations and the private sector were interviewed to gain a broad picture of the culture surrounding food loss and waste. Availability of actors in the retail sector was limited for these interviews, making it difficult to obtain an accurate and representative impression of the culture surrounding food loss and waste in the retail sector, as well as how the industry is tackling this issue.

Food Safety Policy from a Food Loss and Waste Perspective

Food loss and waste is a notoriously difficult problem to measure due to the lack of accurate and consistent metrics to determine the scale of the issue. In Canada, food loss and waste is worth an estimated \$27 billion annually.³³ The general consensus among stakeholders interviewed was that while businesses are generally aware of some of the food loss and waste that occurs in their facilities, they must often deal with competing priorities, or sometimes fail to see the additional costs that result from food loss and waste, and therefore are not able to address the issue properly. Although responsibility for food loss and waste is generally placed upon actors along the food chain from farm to fork, it is equally important to consider the existing policies which may influence the behaviours of food producers and consumers. The food safety policies mentioned above are designed to protect the food supply from any contamination and to ensure a high quality product. This may have undesired consequences resulting in food loss and waste at multiple levels of the value chain.

In Canada, food safety regulations exist at the federal, provincial, and even municipal levels. This analysis will only examine federal food safety regulations alongside industry standards such as CanadaGAP, SQF and GlobalGAP. At the federal level, food safety policies are mostly outcome-based, allowing industry to set their own processes provided they meet the desired

food safety outcome. These are known as product standards, as they set the requirements for the final product. In general, industry standards do not go above and beyond federal product requirements in terms of product safety, but instead set the process requirements for how the outcomes defined by the regulations need to be achieved.²⁸ For example, where the federal regulations will set the acceptable amount of pesticide residues for fresh fruits and vegetables, industry guidelines will set the standards for how these pesticides are applied, handled and stored in the facility.

The degree of freedom in process design provided by the federal regulations makes it difficult to identify specific regulations which may create avoidable food loss and waste along the value chain, as many points where food loss and waste are created may be a result of individual company processes, breach of process or inadequate employee training. There are, however, a few sources of food loss and waste that may be attributed at least partially to existing federal and industry food safety requirements which could be improved upon without compromising the health and safety of consumers. These requirements include fresh produce appearance standards, requirements for safe handling and transport of produce, and policies regarding disposal of produce.

Fresh Produce Appearance Standards

In the fresh fruit and vegetable sector, one of the biggest causes of food loss and waste is produce being left in the field to rot or discarded by businesses and consumers due to its appearance. This may be attributed to the produce's abnormal shape, size, colour, bruising, hail marks or other physical defects which may make the fruit or vegetable unappealing or unfit for marketing.

In Canada, the *Fresh Fruit and Vegetable Regulations* (and starting January 2019, the *Safe Food for Canadians Regulations*) set out grading requirements for the following crops produced in Canada: apples, apricots, blueberries, cantaloupes, cherries, crab-apples, cranberries, grapes, peaches, pears, plums and prunes, field rhubarb, strawberries, asparagus, beets, Brussels sprouts, cabbage, carrots, cauliflower, celery, sweet corn, field cucumbers, greenhouse cucumbers, head lettuce, onions, parsnips, potatoes, rutabagas, field tomatoes, greenhouse tomatoes. Grade labelling is mandatory for the above crops for which the regulations specify a grade, and the grade can only be attributed to produce which meets the requirements. For example, top grade apples must meet a prescribed standard for colour intensity, and parsnips must not be "turnip-shaped or so forked or misshapen as to materially affect the appearance of the parsnips".³⁴ Under the new SFCR, grades will be voluntary for fresh blueberries, fresh cantaloupes, fresh crabapples, fresh cranberries, fresh field rhubarb and fresh strawberries. Indicating a foreign grade on a container of produce is allowed when there are no established Canadian grades for this product, such as in the case of oranges or mangoes.

These requirements, which are primarily focused on the appearance of produce, raise some questions as to the relationship between food safety and grading requirements. Consultation with experts at the CFIA have confirmed that the grade attributed to a fruit or vegetable has no bearing on the safety of the product in question, and is solely an aesthetic quality grade. Grades are used for fresh fruits and vegetables as a point of reference to establish expectations for product quality and to assist industry in setting prices for contracts between buyers and sellers.³⁵ Third party certification systems generally do not have requirements for the appearance of fresh fruits or vegetables, unless these defects may affect food safety (i.e.: insect

damage, mold, etc), in which case the requirements generally recommend the product be discarded. Major retailers, however, tend to exclusively sell the highest grade produce for consumer consumption, in spite of there being no regulatory or third party requirement for them to do so.

The strict requirements for the attribution of a #1 grade to a product result in approximately 5 to 15% of produce being rejected in the field or at grading. To ensure they can still meet their contracts with retailers, producers must therefore plant in excess of the demand to account for the anticipated loss.³⁶ The result is that in a good production year, there will be excess produce to be sold at the retail, while in a poor production year, losses due to poor appearance or smaller size of produce will be greater.

An interview with a produce growers' association revealed that there is not a sustained market for low grade produce. While certain producers may be able to sell lower grade produce for transformation through contracts with processors, this is usually limited to a small number of commodities such as apples or tomatoes. The issue with the sale of lower grade produce does not stop at the producer level. In markets where low grade produce does make it to the retail environment, for example in the case of Loblaw's *Naturally Imperfect* line, the main appeal of the product is not the cause of reducing FLW, but the low cost. As a result, many producers worry that the sale of low grade produce at a lower cost will drive down the cost of their highest grade produce, thus resulting in a loss of profit. It is often more cost effective for producers to discard lower grade produce or return it to the field than to attempt to find a market for it. In addition, the sale of lower grade produce at a reduced cost reinforces the idea that "ugly" produce is poor in nutritional quality compared to high grade produce, when in fact they are nutritionally equivalent.

Storage, Labelling, Handling and Transport Requirements

It is well known that a portion of the food loss and waste along the value chain occurs due to issues with the processes for handling, storing and transporting fresh produce. These include inadequate sorting, spillage and degradation, cold chain deficiencies, inadequate employee behaviour and contamination events along the value chain.

The existing *Fresh Fruit and Vegetable Regulations* specify that all processes for handling, storing and transporting produce be designed in a manner to prevent spoilage and ensure a safe product. This includes the requirement to maintain appropriate conditions for storage of the product throughout the value chain, and accurate labelling requirements. Due to the outcome-based nature of federal food safety requirements, it is difficult to assess whether any of these may be responsible for avoidable FLW along the value chain. In general, if a company's processes conform to the regulations and any other standards for which they are certified, they will minimize most sources of FLW due to poor temperature conditions, cross contamination and other potential food safety issues.

An important component of food safety regulations is the requirement for traceability of a product in the event of a food safety investigation. Current regulations require each business handling produce to be able to trace the product one step forward, and one step back in the production chain. In the event of a foodborne illness outbreak where a recall is necessary, prompt identification of the location of all product needing to be recalled is key. There is an additional challenge for fresh fruits and vegetables in these situations due to their short shelf life. In these instances, by the time the culprit is identified, the shelf life of the product has

usually already passed and a recall is not possible. In addition, fresh fruits and vegetables are often sold in bulk to consumers, and lots are intermixed at the processing level, creating additional challenges with regards to traceability. Accurate and rapid trace back of these items would allow for the identification of all points in the value chain where the product was handled, and may reveal whether the food safety issue at the root of the outbreak is at the farm-level or at the processing level, allowing for disposal of only the affected products.

Some businesses have implemented additional measures which may help prevent food loss and waste. For example, Loblaw requires the use of reusable plastic containers (RPCs) for transport of fresh fruits and vegetables to and from their facilities, even going so far as requiring vendors provide written justification if they choose not to use RPCs.³⁷ The benefit of this requirement is twofold, since RPCs are more environmentally friendly than cardboard boxes due to their ability to be reused and sanitized. From a food loss and waste point of view, the use of RPCs has been shown to help prevent damage and loss of produce in transport, as RPCs are more likely to protect the produce compared to cardboard boxes, which can easily be punctured or broken.³⁸

Disposal of Produce

The *Fresh Fruit and Vegetable Regulations* do not provide specific guidance on how to dispose of produce when it cannot be sold at retail. The regulations do allow fresh fruit and vegetables to be diverted to animal feed provided that they are fit for use as animal food, labelled as such and prepared separately from food intended for human use. Private food safety guidelines do not provide much additional guidance with regards to the disposal of unused or inedible produce, often only specifying when produce should be disposed of in the event of contamination, rather than how. Without clear guidance on the disposal of produce, businesses are left with the choice of how to proceed. As a result, practices in industry vary widely, with some businesses choosing to return unsold produce to the field or to compost, others choosing to send it to be used as animal feed, and some simply choosing to send the produce to landfill and absorbing the cost of disposal.

Some major retailers currently have programs in place to ensure minimal food waste occurs in their retail environment. These initiatives include discounting close-to-date products, selling low grade produce at a discounted price, and partnering with food rescue organizations such as Second Harvest or local food banks to donate unsold products. Businesses are often reluctant to donate perishable products due to concerns about liability in the event of foodborne illness outbreaks. However, numerous laws in Canada protect businesses from liability in the event of illness caused by donated food.³⁹ Furthermore, in the case of fresh fruit and vegetables, organoleptic attributes are often an indicator of whether or not food is fit for human consumption. There are therefore many ways to ensure that produce that is fit for human consumption can still be used as such without compromising on safety.

Requirement for Third Party Certification

Although the federal food safety regulations do not require businesses to adhere to any industry guidelines or third party certification schemes, certification with a third party program has become somewhat of an industry standard. With the upcoming implementation of the *Safe Food for Canadians Regulations*, the role of third party certifications is expected to become even more important as the federal standards shift to an outcome-based model, leaving industry to set its own processes.

Several large retailers require their vendors to acquire a third party certification with one of the many recognized schemes such as CanadaGAP. For these retailers, the certification requirement ensures consistency in the processes used by their vendors, and provides an additional measure to ensure the safety of their product. However, certification with these organizations can result in hefty costs for businesses, from the costs of modifying facilities to meet the requirements and training employees, to registration and audit fees to maintain the certification.²⁷ In the case of some third party certification systems such as CanadaGAP, the cost for registration and auditing is the same regardless of the size of the operation. This means that while larger operations may be able to recover these costs fairly quickly due to the size of their operations and their profits, smaller businesses may struggle to afford these certifications.²⁷

A lack of a recognized third party certification may mean that a business is unable to access major retail markets, instead selling their produce on the farm, in farmers' markets and to small, independent retailers who do not require these certifications. With the rising importance of third party certification systems, the number of smaller fruit and vegetable producers who will be required, and potentially unable, to meet these standards may increase.

Recommendations

All actors of the food chain, including government, industry and consumers, can play a role in reducing food loss and waste. Based on the food safety policy elements identified as potential contributors to avoidable food loss and waste, the following recommendations aim to ensure cooperation from all actors in reducing wasteful behaviours along the value chain.

A Policy Approach to Reducing Food Loss and Waste

The Government of Canada has conducted consultations with the public on a new *Food Policy for Canada* initiative. This food policy will set long term goals to ensure Canadians have access to safe and affordable food, all while conserving soil, water, and air quality and increasing the production of high quality food in Canada.⁴⁰ In December 2017, the Standing Committee on Agriculture and Agri-Food published their recommendations for *A Food Policy for Canada*, including only one recommendation related to food loss and waste. The report emphasizes the amount of waste that occurs at the consumer level, and proposes that “the Government, in conjunction with all members of the supply chain, establish education tools and take action to reduce industry food loss and consumer food waste.”⁴¹ This analysis has shown that appearance of fresh produce can be a major factor in food loss and waste along the value chain. This can be attributed in part to the strict standards set by the federal standards for the appearance of fresh produce, but also by consumer expectations that the produce they purchase be free of blemishes, and of regular size. It is difficult to say if consumer expectation stems from the regulations being in place, or if the regulations come from a desire to sell and consume aesthetically pleasing produce, but the result remains the same. If progress is to be made regarding food loss and waste in industry and at the consumer level, concrete actions are required from all actors along the value chain, including government.

Measuring Food Loss and Waste

It is difficult to address the issue of food loss and waste if its source is so diverse and the exact amount of waste that occurs is unclear. While businesses may be aware of the additional costs incurred by food loss and waste in their production, many only see these costs as the cost per tonne of waste sent to landfill. However, the costs related to food loss and waste go far beyond those of landfill disposal, due to the costs associated with labour, water, electricity used in production of food that ends up being wasted and carbon emissions from food in landfills. Therefore, identifying the root causes and the scope of food loss and waste along the value chain is the first step in addressing the issue.

Existing initiatives such as the Provision Coalition's Food Loss and Waste Cost Share Program help businesses identify and address sources of food loss and waste and measurable solutions for the prevention and reduction of it along their production line.⁴² The use of metrics can help identify not only sources of food loss, but also areas where resources such as water and electricity could be saved. Putting a dollar amount on these areas may serve as an incentive for businesses to make a change to their practices. For example, in one published Provision Coalition case study conducted in a bakery, over 84,000kg of retail product returned due to expiry was identified, and the program identified that the installation of a second reclaim chute for seeds used on baked goods could reduce annual losses by 30,000kg and \$80,000 annually.

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While the Provision Coalition initiative is short term and has limited funding, it is interesting to note that the measurement of food loss and waste in a business can reveal clear, measurable, and realistic solutions to reduce food loss and waste in a facility. Similar measures applied across the industry could result in significant reductions in food loss and waste. Addressing food loss and waste as an environmental sustainability issue is in line with the federal government's commitment to reducing greenhouse gas emissions to 30% below 2005 levels by 2030.⁴⁴ Government-funded initiatives currently exist for businesses implementing sustainable development measures in an effort to reduce greenhouse gas emissions across the country.³⁶ Incentivising food loss and waste reduction measures by creating tax rebates or other funding opportunities for businesses which implement measures to reduce food loss and waste in their facilities is one avenue that federal agencies or its partners could consider. In the end, a reduction in food loss and waste can result in reduced energy usage and waste production, as well as a reduced carbon footprint.

Changing Culture Regarding Ugly Produce

One of the most important sources of food loss and waste of fresh fruits and vegetables identified in this report include the requirements for the appearance of fresh produce. While the Canadian food safety regulations set out the standards for the appearance of fresh fruits and vegetables, the link between the appearance of produce and its nutritional value and safety for human consumption is not made clear in these regulations. In the case of commodities such as shelled eggs, the grade attributed is an indication of food safety, and therefore lower grade eggs can only be used for processing with heat treatment.⁸ However, this is not the case for fresh fruits and vegetables, where blemishes, odd shapes, or smaller size resulting in a lower grade being attributed do not create a concern for food safety or nutritional quality, according to an expert at the CFIA. The attribution of a grade to fresh fruits and vegetables can therefore be misleading to individuals or businesses. Federal grading requirements should be clarified to distinguish grades attributed for quality purposes from grades attributed for safety purposes.

Under the Fresh Fruit and Vegetables Regulations, a change in grading standards would require a regulatory amendment, which can be a lengthy and complex parliamentary process. Under the new SFCR, however, the Canada Grade Compendium is incorporated into the regulations by reference, which means that the Compendium can be modified as needed without needing to go through the regulatory amendment process.⁴⁴ While modifying the grade compendium would still require stakeholder consultations, the process under the SFCR will be far simpler, thus opening the door to modification and modernization of these outdated grading standards.

Although the appearance of the fruits and vegetables we see in grocery stores is at least partially regulated by federal standards, the choice retailers make to sell high grade produce is a cultural one. Consumers have grown to expect an aesthetically pleasing fruit or vegetable, with uniform shape, size and colour, and seem to believe that produce with these attributes is of higher quality and safety. As previously noted, it is clear to food safety regulators that the appearance of fresh fruit and vegetables has no bearing on food safety or nutritional quality. The issue therein lies in consumers' perception of fresh produce. The "when in doubt, throw it out" mentality is quite pervasive in the food industry, and extends to consumers' homes. This mentality is even supported by the federal government's public communications on food safety at home, and the catchy slogan appears multiple times on the food safety section of Canada.ca.¹⁹ Increased awareness and education is necessary regarding the relationship between safety and appearance of fresh fruits and vegetables to reduce the amount of waste occurring both in industry and in consumer homes. Awareness campaigns should be aimed both at industry and at consumers, with the goal to increase the number of industry contracts for the sale of lower grade produce, allowing farmers to sell more of their product, and increasing the supply of affordable fresh fruits and vegetables for consumers.

Less Food in Landfills

Businesses often struggle to address issues such as food loss and waste, not because they are not aware of its existence or that they do not believe it is worth addressing, but because competing priorities often take precedence over these issues. A national policy requiring businesses to address their food loss and waste issues similar to those passed in some European countries, or even policies at the food production level could be a major component of the fight against food loss and waste.

Federal policies and regulations do not clearly outline the ways in which businesses must dispose of produce when it cannot be sold at full retail value as intended, and industry guidelines rarely provide much additional guidance on the matter. Reasons for disposal may include poor produce appearance, unsold produce nearing the end of its shelf life, produce contaminated or damaged along the value chain. Clarification of policies on how to handle produce intended for disposal, and the creation of a number of routes for either prevention or diversion of waste could help businesses reduce their food loss and waste burden. Such tools could be as simple as the creation of a decision tree to determine which route is the best for disposal of foods depending on the reason for its disposal.

Due to the competing priorities businesses are often faced with, relying on voluntary action alone to reduce food waste may be insufficient, particularly in the case of producers. It is costly for farmers to harvest produce they cannot sell at full value, and therefore worthwhile incentives are necessary to ensure cooperation between producers and food rescue organizations. These incentives could come in the form of tax rebates for producers who have partnerships with

charitable organizations for the donation of produce, or grants to finance the harvesting and transport of these products.

Businesses who choose to implement their own measures to further reduce food waste are free to do so, but major change in the industry may not occur from voluntary action alone. Recognizing that, a policy approach to determining proper disposal of produce may be necessary to ensure a consistent minimum-level of waste prevention and diversion across industry. Following the model of some European countries such as France and Italy, a requirement for retail businesses to cooperate with local food banks for the donation of unsold food would help divert a large portion of fresh produce currently being thrown out at the retail level.

Many businesses worry about the legal ramifications of food donation in the event that illness occurs as a result of donated food. However, a number of provincial and territorial laws provide significant protections from lawsuits to those who donate food to charitable organizations. In addition, there are no recorded instances of a business being sued for donating food which caused illness.³⁹ Increased awareness about these protections may ease the worries businesses might have about food donation.

Organizations such as Second Harvest already partner with businesses in Ontario to rescue unsold food and coordinate donation to local charitable organizations. One of the pitfalls of the food donation law in France has been the inability of supermarkets to coordinate transportation of donated food to local charities.⁴⁵ In Ontario, Second Harvest takes the burden of transport off businesses by sending out their own fleet of refrigerated trucks to pick up and deliver fresh food.¹⁰ Scaling up these efforts to a national level would likely be a challenge, but would result in the rescue of large amounts of healthy food currently being sent to compost or landfill when it would otherwise be fit for human consumption.

Conclusion

It is clear that a concern for food safety is responsible for a portion of avoidable food loss and waste in Canada. However, the role that food safety policy plays in this avoidable waste is not easily quantified. The analysis of existing federal policies and industry guidelines has revealed that while some food safety requirements have a direct impact on food loss and waste, others may also have downstream effects which can lead to avoidable loss and waste. For example, the strict requirements for the appearance of fresh fruits and vegetables may directly lead to large amounts of produce being graded out and discarded, while a lack of clear industry or government guidance on the disposal of unsold produce may result in more produce being sent to landfill than necessary. Additional guidance from food safety authorities is necessary to ensure food sent to landfill is kept to a minimum, and as much food rescue as possible can occur. However, the broad scope of behaviour, policies and cultural perceptions at the root of food loss and waste makes the issue incredibly difficult to tackle with a one-size-fits-all approach. Concerted efforts from industry and governments to educate industry and consumers on the relationship between produce appearance and safety and food loss and waste are key to reducing the amount of waste related to “ugly” or low grade produce. Significant work remains to be done to fully understand the root causes of food loss and waste and to develop solutions to maximise food rescue and minimize the amount of food sent to landfill.

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