



Reducing Vegetable Waste in the Holland Marsh

Project Update

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By: Mary Ferguson

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FROM OUR FARMS TO YOUR TABLES

The Holland Marsh Growers' Association helps to promote the Holland Marsh's produce, partners with researchers on projects that impact the growers, help navigate applicable laws and government programs, and work with government and agencies from the municipal to federal levels.





INTRODUCTION

The Holland Marsh is located within Simcoe and York counties. It covers 131,500 acres of farmland, of which just under 11,000 acres are rich muck soil ideally suited for horticulture production. There are 66 types of vegetables produced in the Holland Marsh with the predominate crops being carrots and onions. Horticulture crops generate over \$105 million in farmgate value (2016) and an additional \$80 million generated in storing, packing, and processing vegetables¹.

Vegetable waste is very concerning to Holland Marsh growers and packers. It equates to lost revenue, greenhouse gas production, and is lost potential in delivering nutritious food for Canadians. This report identifies potential strategies and solutions to prevent vegetable waste, new market opportunities for cull vegetables, and green solutions to address unavoidable vegetable waste.

Food waste is a systemic problem with all players in the value chain contributing.

ISSUE OF FOOD WASTE

Food waste is an economic, environmental, and social issue. According to The Avoidable Crisis of Food Waste: Technical Report, 58 percent of food produced for Canadians is lost or wasted along the food value chainⁱ. In the 2017 Business Case for Reducing Food Loss and Waste showed that 99 percent of the 700 companies analyzed (food manufacturing, food retail, hospitality, and food service) earned a positive return on investment in reducing food loss and wasteⁱⁱ. Decomposing organic material in anaerobic conditions – by microbes in the absence of oxygen – release methane into the atmosphere. Methane is 25 times more potent than carbon dioxide as a greenhouse gas and is a significant contributor to global greenhouse gas emissions.^{iv} Nearly 600,000 people made more than 3.6 million visits to food banks in Ontario between April 1, 2020 and March 31, 2021 according to the Feed Ontario annual report. This is a 10 percent increase since the last food bank peak during the 2009 recession^v. Not surprisingly industry, government, and societal organizations have identified food waste as important issue. There is a cultural acceptance of waste in Canada. We are a take, make, waste society. Food waste is a systemic problem with all players in the value chain contributing.

GLOBAL, NATIONAL, AND PROVINCIAL FOOD WASTE STRATEGIES

Food loss and food waste is a global issue. Canada is fortunate to be a country of abundance, yet there are over four million Canadians living in food insecure households^{vi}. Four of the United Nations Sustainable Development Goals touch on food through the issues of food security, health, production systems, and climate action. The Canadian Food Policy is aligning its targets with the following four Sustainable Development Goals.

SDG 2	Zero Hunger
Target 2.1	By 2030, end hunger and ensure access by all people, in particular the poor and people in vulnerable situations, including infants, to safe, nutritious, and sufficient food all year round.
SDG 3	Good Health and Well-Being
Target 3.4	By 2030, reduce by one third premature mortality from non-communicable diseases through prevention and treatment and promote mental health and well-being.
SDG 12	Responsible Production and Consumption
Target 12.3	By 2030, halve per capita global food waste at the retail and consumer levels and reduce food losses along production and supply chains, including post-harvest losses.
SDG 13	Climate Action
Target 13.3	Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning ^{vii} .

FOOD POLICY FOR CANADA

In 2019 Canada published its first Food Policy for Canada. The food policy guides food-related decisions and actions for government, industry, and community and encourages these groups to work together to address food related challenges^{viii}. There are six priority outcomes in the policy. Finding solutions for cull vegetables can be incorporated into and contribute to at least five of the six outcomes including: increased connections within food systems, improved food-related health outcomes, vibrant communities, sustainable food practices, and inclusive economic growth.

ONTARIO'S FOOD AND ORGANIC WASTE POLICY STATEMENT AND ACTION PLAN

In 2016 Ontario published the Food and Organic Waste Policy Statement and the Food and Organic Waste Framework: Action Plan. Acting on the two documents will help the province achieve their visionary goals of zero waste and zero greenhouse gas emissions from the waste sector. The policy statement focuses waste reduction and resources recovery through preventing and reducing food waste, effectively and efficiently collecting and processing food and organic waste and reintegrating recovered resources back into the economy^{xi}. The policy identifies specific activities for the various players in the industry to address food waste.



Large food processors (generating more than 300kg of food waste per week) should:

- Identify where food waste occurs in their operation, conduct regular food waste audits to quantify the amount and type of food waste and take measures to prevent and reduce the amount of food waste that is occurring.
- Incorporate the use of imperfect produce in food processing and in food and meal preparation.
- Make imperfect produce available to consumers.
- Develop relationships with food rescue organizations in order to facilitate the safe distribution of surplus food in a timely and effective manner^x.

The provincial government's role includes supporting research, innovation, and knowledge mobilization aimed at reducing and recovering food and organic waste in collaboration with the agri-food sector, academia, and research institutions.

REDUCING LITTER AND WASTE IN OUR COMMUNITIES

Ontario Ministry of the Environment, Conservation and Parks published the 2019 discussion paper, *Reducing Litter and Waste in Our Communities*. Avoiding food waste, rescuing surplus food, and diverting unavoidable food and organic material is good for the environment and good for business. The Ontario Community Food Program Donation Tax Credit for Farmers provides tax credits up to 25 percent to farmers who recover and donate agricultural products to eligible programs. The government is committed to making it easier to rescue, donate, and use surplus food safely to support local communities by developing guidance for safe food donations and supporting innovative platforms and technologies to connect food businesses with social agencies^{xi}.

Ontario is moving forward on banning food waste from landfills this year. Composting organic material is better for the environment and will extend landfill capacity. While this won't directly affect the Holland Marsh farms and packers, as those interviewed stated they compost or spread organic material on fallow land, it should lead to more local waste-to-energy and industrial composting infrastructure that packers could use in the future.

INDUSTRY DIRECTION ON FOOD WASTE

LOBLAW'S CORPORATE SOCIAL RESPONSIBILITY (CSR)

Loblaw Companies Ltd. is an industry leader and committed to their environmental, social, and governance goals. They continue to lead change in the food industry. Loblaw's Corporate Social Responsibility Report 2020 re-confirms that both food waste and plastic use are ranked very high in importance to stakeholders. Two actionable targets have been established to address food waste.

- Reduce food waste by 50% in our corporate retail operations by 2025, against a 2016 baseline.
- Enhance our food waste reduction efforts by enlisting 20 suppliers in 2021 who will commit to halving their food waste by 2030^{xiii}.

That Loblaws is extending their CSR targets to incorporate suppliers changing processes and behaviours sends a powerful message about how food waste will be viewed and dealt with in the future. Packers contracting with large retailers may need to meet waste reduction targets as a condition to be a supplier.

ANTHESIS PROVISION (FORMERLY PROVISION COALITION)

In 2013 Provision Coalition commissioned the Developing an Industry Led Approach to Addressing Food Waste in Canada report. The report identified the amount of food lost along the value chain, root causes and strategic next steps to address food waste in Canada. Many of the key findings of the 2014 report still hold true. Value Chain Management International was a lead author on this report as well as The Avoidable Crisis of Food Waste: technical report published in 2019 which identified some of the same findings including:

1. No common measures of food waste and its impact on businesses and the environment.
2. Food waste is not a high priority for many businesses. The primary reason for this is that most businesses do not know the amount of food that they waste and its real impact on profitability.
3. Pioneers in reducing food waste tend to be larger businesses with more sophisticated management systems, more resources, and more stringent corporate social responsibility mandates.
4. The main barriers to addressing food waste, particularly for preventing food waste at source, were the attitudes and behaviour of management and staff.
5. Businesses need to switch focus from waste diversion to waste reduction and maximizing value from waste. They also need a better understanding of the full range of wastes associated with food waste (e.g. energy, labour, production capacity, etc.) to strengthen the business case for reducing food waste.

QUANTIFYING CULL VEGETABLE WASTE AT PACKING PLANTS

Five large and two small packing operations in the Holland Marsh were interviewed for this report. Based on the interviews, there is no standard definition of waste or method to measure and report on vegetable waste. Are cull carrots sold for horse feed considered waste? Is waste measured as a percentage of incoming product or weight going for compost? How are food bank donations included in this equation?

For this report, vegetable waste is defined as vegetables and vegetable pieces (crowns, peelings, chunks, skins) coming from the packing line, processing line, or storage, that have no market and end up in compost, spread on fallow land, or sent to landfill. Vegetables are culled for various reasons including under / over sized, discoloured, misshapen, rotten, diseased, nicked, limp, or broken. Some culls can go to secondary markets while others cannot e.g. an over-sized carrot will get further processed, a rotten carrot must be discarded. Vegetables left in the field at harvest are not addressed in this report.

The vegetable packers interviewed have multiple markets with a sliding scale of return from fresh Canada N° 1 product to free animal feed and donations to food banks. Markets identified include:

- Canada N° 1 fresh product
- Processed fresh vegetables (peeled, cut, shredded, etc.)
- Cutting over-sized, misshapen carrots into smaller pieces for further processing e.g. bagged salads, etc.
- Further processing for canned vegetables, frozen vegetables, soups, baking, baby food
- Potato starch and flaking
- Food for American correctional facilities
- Livestock feed, equine feed, pet food, bait for hunters (sell or free)
- Food bank and food rescue donations
- Vegetable waste composted on farm and returned to the soil
- Vegetable waste spread on fallow land
- Vegetable waste (onions) sent to landfill



Packer	Amount of Vegetable Waste and Disposal Method
Packer #1	Doesn't track waste. Donates over 100,000 lbs to Daily Bread Food Bank annually (and gives to other food banks). Sells cull vegetables for animal feed and hunting. 20-yard bin (24,000lbs) of waste vegetables composted every day (5 days / week).
Packer #2	Uses cull vegetables for animal feed. Composts remaining waste using a Sittler composter. Compost is tested and then spread back on soil.
Packer #3	20 MT of organic waste generated per week including dirt, debris from polishing, tops, rotten carrots, and rejected vegetables. Onion waste goes to landfill.
Packer #4	Does not track waste amount. Gives waste carrots, peelings, tops away for animal feed.
Packer #5	Sells cull vegetables for animal feed. Remaining waste is spread on fallow land.
Packer #6	About 15-20% of incoming product is waste which generates 12-15 1300 lb boxes of waste carrots each week. All waste is either sold or given away for animal feed or bait. Less than 1% would go to compost. No vegetable waste is landfilled.
Packer #7	Estimates 30-40% of incoming product is waste. Waste is sold or given away for animal feed. Organic waste is dumped on unproductive land.

The packers interviewed estimated on average 30% of incoming product is culled with the caveat that waste can fluctuate significantly from one year to the next due to weather conditions and disease pressure and waste fluctuates from one producer to the next due to production practices and storage conditions.

ADDRESSING VEGETABLE WASTE IN THE HOLLAND MARSH

There are multiple factors that lead to vegetable waste. Defining what is vegetable waste, assessments, promoting sustainability efforts, production and packing practices, storage conditions, markets, food rescue, and composting all play a role in addressing vegetable waste.

1. DEFINING AND REPORTING

What is vegetable waste? Is it anything that doesn't make Canada N° 1, anything without a profitable market, anything that is given away, or just what ends up in the compost pile? Growers, packers, retailers, food rescuers, and livestock farmers might all answer this question differently.

Defining what is vegetable waste and developing a standardized framework to measure and report on vegetable waste would help growers and packers recognize lost potential, investigate root causes, and stimulate corrective actions. Changing an organization's mindset on waste requires commitment from the owners, managers, and the staff.

For the purpose of this report, vegetable waste includes the pieces, peelings, and rejected vegetables that end up being composted or landfilled. Donated vegetables (food rescue) and imperfect product that is further processed into foods and food ingredients play an important role in the food system. Unsalable vegetables used as livestock feed (sold or donated) are converting low quality vegetables into high quality protein.

The Avoidable Crisis of Food Waste Technical Report 2019 identified the following actions regarding defining and reporting food loss and waste (FLW) that the vegetable industry could adopt:

Farm / Packer

- Start measuring vegetable waste
- Set vegetable waste reduction targets
- Value the benefits of meeting waste targets
- Understand the root causes of vegetable waste and work to improve

Industry Organization

- Produce a common vegetable waste reporting framework (industry organization)
- Publish guidance on collaboratively addressing vegetable waste
- Set vegetable waste reduction targets^{xiii}.

If the leadership team at the packers sees the value in all grades and markets, a culture shift can happen: one that is perfectly aligned with sustainability.

2. ASSESSMENTS (INCLUDING CULTURE OF WASTE)

Once vegetable waste has been defined and a framework for collecting data and reporting on waste has been established, growers and packers can more easily assess their challenges with vegetable waste. Identifying the root causes of waste creation helps elucidate the opportunities to reduce waste. Accounting for the full cost of waste (e.g. production, labour, energy, land, capacity, etc.) illustrates the real impact on profitability and will drive the business case for waste reduction. Commitment to waste reduction strategies at the senior level will drive change at all levels. Assessments can be done independently or through hiring a professional consultancy.

Anthesis Provision

Anthesis Provision (formerly Provision Coalition) is a Guelph Ontario consulting company focused on sustainability in the food sector. They have worked with all types of food companies including growers, packers, and greenhouses. They specialize in preventing waste creation from food, materials, water, and energy. The work to rebuild supply chains, upcycle food “waste”, build circular economies with food waste, conduct waste audits and food waste prevention projects with returns-on-investment in a defined payback period.

The Re(Purpose) Incubator is a Canadian Agricultural Partnership funded program open to food manufacturers producing by-products that have value. Anthesis Provision is delivering the program and they have funding to take six companies through a step-by-step process to create a new upcycled ingredient or product so their food “waste” start generating revenue. More information about Anthesis Provision and the Re(Purpose) Incubator is available at provisioncoalition.com

Enviro-Stewards

Enviro-Stewards is an Elmira Ontario consulting firm that works to find sustainable solutions to food “waste”. They have worked with over 50 food manufacturing operations where they found over \$240,000 of food that didn't have to be wasted per factory per year. By implementing recommended changes, the average payback period is 10.5 months. More information is available at envirostewards.com.

3. PROMOTE WASTE REDUCTION EFFORTS

There are great stories waiting to be written on the environmental initiatives, good stewardship, food donation, food rescue, support for research on upcycled food products, infrastructure investment to improve storage conditions, and equipment improvements to prevent vegetable waste through harvesting and processing. Individual packers and the vegetable industry should highlight these initiatives to promote their products, brand, and the collective industry. Public good news stories may create the awareness and the nudge for other growers and packers to improve their sustainability efforts.

4. FIELD PRODUCTION AND PACKING



Mother Nature and production practices impact how much waste will be generated. One packer interviewed stated that waste fluctuates from farmer-to-farmer, and he has seen as high as 50 percent of crop going to waste. Good rotations, proper soil conservation, regular scouting, thoughtful production management decisions, well trained employees, good equipment, luck with the weather, and good timing all contribute to a healthy bountiful crop.

While farmers cannot control the weather, they do have lots of tools to encourage good yields and achieve high pack-out percentages. Following best management practices in all areas of production will impact the current crop as well as future crops. Ensuring that harvesting and tipping equipment is working optimally and managing the fine balance between running a fast production line while minimizing breakage is key in preventing vegetable loss.

Employing a great team of field and packhouse workers that are well trained and committed to the sustainability goals of the operation is critical. Sharing the waste reduction goals, setting waste reduction targets, measuring, reporting, and rewarding staff will contribute to a culture that values sustainability and works to prevent waste.

5. STORAGE

Storage conditions are an opportunity for improvement identified by the packers. Older storage facilities rely on pulling cool air from outside into the storage facility and pushing it through the vegetable boxes or piles. It's difficult and expensive to push cold air to the bottom of the vegetable boxes and there is less control of temperature and humidity in the older style facilities particularly when there are fluctuating temperatures outside^{xiv}. The impacts of climate change are resulting in more extreme weather on a more regular basis. The temperature in Bradford Ontario reached 18° C and 17° C in December 2021 which makes it difficult to achieve the ideal storage conditions effectively shortening the length of time product can be stored.

New storage technology pulls air through vented vegetable bins using computer regulated controls for humidity and temperature. Investment in storage infrastructure is costly, but increases the pack-out percentage, reduces electricity costs, allows for longer storage, reduces the amount of vegetable waste and the associated environmental costs of wasted vegetables. One packer interviewed stated their new storage facility has resulted in a 15 percent increase in pack-outs, uses 60 – 65% less electricity, and allows them to store product for 10-14 months instead of 6-8 months.

6. CREATING AND FIND NEW MARKETS

The packers interviewed identified several markets for their products on sliding compensation scale. At the lower end of the scale, they are receiving minimal compensation but are at least moving the product by selling or giving cull vegetables for animal feed or donating imperfect product to food rescue organizations. Finding additional market opportunities for cull vegetables can provide additional revenue and can also improve the sustainability scores of the packing operation, by reducing waste and producing more nutritious food products for people and animals.



Research – Using Cull Carrots to Produce Upcycled Foods and Food Ingredients

Several packers in the Holland Marsh already do some processing of vegetables to create added value e.g. cutting lower grade carrots into pieces or shredding carrots for bagged salads. Dr. Ashutosh Singh and his graduate students at the University of Guelph have been working on three innovative technologies that packers could use to upcycle cull carrots and other vegetables.

Using commercially available equipment, carrot purée can be produced for use in baking, soups, and sauces. The new puréeing process is a zero-waste option for cull carrots and doesn't expose the carrots to high temperatures. This allows for the retention of natural flavours, better sensory characteristics, and phytochemical and nutritious properties in the food to remain intact^{xv}. Entrepreneurial packers could work with food manufacturers looking to increase the sustainability aspects of their food products and build a market for the purée. The packers could produce the nutritious purée from culls which may have otherwise been destined for the compost pile.

Dr. Singh has developed equipment and a process to produce carrot powder from cull carrots. Traditionally, when powders are made, the process starts with making a juice and all of the fibre becomes a waste product. Dr. Singh's new process / technology uses the whole carrot so there is no waste and the end result is high in fibre. Packers would need to source a buyer for carrot powder and purchase the equipment or the design from Dr. Singh to begin producing a value-added product from what was once considered waste.

Carrot crisps (think healthy chip) have been developed using a foam mat drying process. Ugly carrots culled due to breakage, size, shape, or colour and the crowns and tips generated through processing are used to make carrot crisps. The culled carrots are pureed, whipped, and baked with additional ingredients and flavouring to make a high protein, high fibre, shelf stable, nutritious snack food. The intention is to take this research and product to the marketplace creating a supply chain for cull carrots.

The research / technologies for these three projects can be applied to other fruits and vegetables. The projects were designed specifically to use cull vegetables and to use the whole vegetable for a zero-waste solution. Research for the three projects will be published in 2022. The research was funded through the Quebec Ontario Cooperation for Agri-Food Research Competition funded through OMAFRA and MAPAQ. Government and industry support is required for research, development, and commercialization of innovative solutions to transform inedible food loss into edible foods and ingredients^{xvi}. More information is available at asingh47@uoguelph.ca, gmadanpo@uoguelph.ca, and dmastron@uoguelph.ca.

Loop Mission

Loop Mission is a growing circular economy business rescuing outcast foods including vegetables that would be discarded because of their size, shape, ripeness, or colour and turns them into juices, smoothies, sodas, kefir, beer, spirits, soap, and dog treats. The manufacturing plant is located in Montreal at Courchesne Larose which is the largest fruit and vegetable buyer in Canada. Loop Mission was established five years ago because Courchesne Larose was throwing out 16 tonnes of food a day and needed a sustainable solution.

Loop pays \$0.11 per pound of fruit and vegetables, regardless of the type. If they have a consistent relationship with a supplier, the price can increase to \$0.18 per pound. Loop picks up the product, requiring a minimum one metric tonne of a single product. The following fruits and vegetables are used in their products: beets, carrots, celery, fennel, jalapenos, kale, romaine, spinach, apples, pears, red grapes, cantaloupe, honeydew, blackberries, blueberries, raspberries, strawberries as well as several tropical fruits and spices. Fruits and vegetables can't be rotten or too old / limp as that would affect the taste and quality of their products. Carrot pieces and crowns are acceptable. Loop products can be found at select retailers including Loblaws stores or ordered online. More information available at loopmission.com or davidc@loopmission.com.

Outcast Foods

Outcast Foods is a plant-based technology company that takes misfit, unsalable, or cast-off produce and turns it into clean, sustainable, nutrient-dense food for wholesale, retail, and consumer use. Products include upcycled fruit and vegetable powders, vitamins, and greens. Outcast Food products can be found at select retailers including Sobeys, ordered online, or wholesale direct from the company.

Construction has just been completed on their new 45,000 square foot manufacturing and distribution headquarters in Burlington Ontario. They pay a fair price or tipping and transportation costs. The new facility intake capacity is one million pounds of fresh crop "waste" / surplus per month. More information is available at outcastfoods.com or bm@createvalue.ca.

Imperfects

Consumers play a very large role in the food waste issue. We want perfectly shaped vegetables, that are the right colour and the right size even though an ugly vegetable may be just as nutritious and tasty. Government and industry need to work together to shift consumer mindset on imperfect fruits and vegetables. Combining consumer education and marketing campaigns to encourage consumers to use imperfect products will create more demand. Loblaw's began selling its Naturally Imperfect™ brand in 2016. How has the market changed since then? Are there opportunities for more products to be added to the Naturally Imperfect line? One packer interviewed noted that one inch diameter onions have no market and are left in the field. Is there an opportunity for tiny onions?

Food Rescue

One packer has been generously donating unsalable but edible produce to the Daily Bread Food Bank for over 15 years. It is a win-win-win option. Donating is the right thing to do for the community, reduces the environmental impact of decomposing vegetables, and generates a sizable tax credit for the farm. The Community Food Program Donation Tax Credit for Farmers gives farmers a tax credit valued at 25 percent of the fair market value of the products they have donated^{xvii}. Growers and packers are covered for liability through the Donation of Food Act should any recipient get sick or injured from consuming the donated food^{xviii}.

Second Harvest is the largest food rescue organization in Canada. They work across the supply chain from farm to retail to capture surplus food and redistribute it to over 3000 not-for-profit organizations across Canada. With a mobile app, fleet of vehicles, a national logistics partner, and dedicated volunteers they ensure healthy, surplus food reaches communities that need it most. Food donors create an account online or through the Second Harvest Food Rescue App and post when they have surplus food to donate (food type and pick-up times). Recipient non-profit organizations receive notifications of the available donations in their area and the corresponding pick-up details^{xix}.

Ensuring that all growers and packers are aware of the tax credits, liability protection, and the organizations and frameworks to make donations easy can help reduce the amount of wasted product and support people and organizations in need. The Holland Marsh Growers Association could establish a campaign to get all growers with storage facilities and all packers connected with a food rescue organization to reduce food loss. More information about Second Harvest is available at foodrescue.ca.

Animal Feed

Holland Marsh packers regularly sell or give cull vegetables away for animal feed. Using cull vegetables as livestock feed reduces the total amount of feed crop acreage required and the associated environmental costs to grow and process the feed crop. This is a relatively small amount of traditional feed being replaced, but it is a sustainable solution for vegetables that would otherwise be waste.

Livestock Bait

Several packers sell or give away cull vegetables for hunting bait. It's unknown how much of the vegetables are consumed by animals versus decomposing in the environment. This is a last option for the packers before sending the vegetable waste to compost.

7. COMPOSTING

Composting waste vegetables is a relatively easy solution for Holland Marsh packers compared to food manufacturers in urban centres. Vegetables compost easily and grower / packers have the staff, equipment, and land required to make and spread compost. It is important that packers make sure all markets for human food and animal feed have been exhausted, before sending any remaining culls to compost. Not all compost is created equally. Composting systems needs to be well managed to minimize greenhouse gas emissions, prevent leachate entering waterways, and minimize odours. Testing compost for quality before returning it to the field is important to ensure weed seeds and plant pathogens have been destroyed.

Investing in a large compost system (e.g. Brome rotary composter) could help packers address other waste on farm including waxed cardboard, roots, and wastewater while minimizing the environmental impact of decomposing vegetables. Waxed cardboard was identified in a few interviews as a big waste issue in the Holland Marsh. The vegetable boxes need to be waxed to maintain their structure in wet and humid conditions, but the wax makes the cardboard non-recyclable. The boxes end up being burned, landfilled, or are collecting on farm. Government support for composting infrastructure would help the vegetable industry be more sustainable by converting their waste streams into environmentally friendly, high-quality compost that can be returned to the soil.

Ontario has committed to ban organic waste from landfills. This won't directly impact most packers as they have sufficient land to compost vegetable waste. However, it will stimulate demand for industrial composting, anaerobic digestion, and other waste-to-energy technologies in the greater Toronto area which could provide solutions for plastic and waxed cardboard waste generated on Holland Marsh farms and packing operations.

CONCLUSION

Food waste has been identified as an important issue at the global, national, provincial, and industry levels due to food insecurity experienced in the community, lost economic opportunity, and the environmental costs of waste. The Holland Marsh packers estimate 30 percent of incoming product is culled. The packers have found secondary markets and give donations of imperfect produce reducing the amount of organic waste. Remaining vegetable waste is composted. It's easy to see a pile of limp, old carrots as just waste for the compost pile, but determining the true cost to produce the carrots including the production, energy, land, processing, storage, and human resource costs along with the environmental costs to grow, handle, and then decompose the waste helps change perspective. Tackling vegetable waste is an issue that growers, packers, industry, and government all need to be involved in. There are profits to be found in reducing waste along with environmental and societal gains. Minimizing food waste contributes positively to the company story and the industry as a whole.

APPENDIX A

REDUCING VEGETABLE WASTE AT PACKING FACILITIES

Steps to reduce vegetable waste at packing facilities:

- Decide that reducing waste is important economically, socially, and environmentally. Build this into the company mission statement. Communicate this to all staff.
- Quantify the amount of product that goes to each market from Canada N° 1 to donated product.
- Quantify the amount of vegetable waste that goes to compost.
- Quantify the value of the waste vegetables and cost of disposal.
- Set a waste reduction target(s).
- Are there market opportunities to move any of the products from a lower market position to a higher market position economically? What would it take to do this in terms of costs, equipment, human resources, contracts, and time?
- What causes vegetable waste at your operation? Is it production, storage, equipment, human resources, grading standards, or marketing challenges? What would it take to reduce the waste in costs, training, human resources, and time?
- What specific action(s) would generate the biggest gains economically, environmentally, and socially?
- What specific action(s) is the easiest to implement?
- Decide which action(s) to take and implement change.
- Measure and report on vegetable waste reduction efforts.
- Tie the story back to sustainability and the company brand. Generate good public relations for the company's sustainability efforts.

APPENDIX B

INTERVIEW LIST

Farms

1. John Hambly – Gwillimdale (2 interviews)
2. Nick Weening – Carrot King
3. Tony Tomizza – Dominion Farms
4. Mike Ferragine – Ferragine Greenhouse
5. Chris Vorberg – Foothills Greenhouse
6. Paul Luksha – Hillside Farms (2 interviews)
7. Steven Kamenar – Hillside Farms
8. Rick Phillips – Phillips Farms
9. Ian Smith – Smith Gardens
10. Joe Chapman – Don Chapman Farms / Lakeview Vegetable Processing

Packers

1. John Hambly – Gwillimdale
2. Nick Weening – Carrot King
3. Tony Tomizza – Dominion Farms
4. Paul Luksha – Hillside Farms
5. Steven Kamenar – Hillside Farms
6. Rick Phillips – Phillips Farms
7. Ian Smith – Smith Gardens
8. Joe Chapman – Don Chapman Farms / Lakeview Vegetable Processing

Industry and Government

1. Jody Mott – Holland Marsh Growers Association
2. Michelle Broom – Ontario Produce Marketing Association
3. John Van De Vegte – OMAFRA
4. Steve Law – Ministry of the Environment, Conservation and Parks
5. Simone Weinstein – Provision Coalition
6. Tyler Whale and Phil Richardson – Biodiffusion
7. Rick Finkbeiner – Bradam Energy
8. Matt Shepard – Bradford Co-op
9. Catherine Abel – Canadian Stewardship Services Alliance
10. Ashutosh Singh – University of Guelph – Food Engineering
11. Dominique Mastronardi – University of Guelph – Food Engineering
12. Gagan Madanpotra – University of Guelph – Food Engineering
13. Sean McCutcheon – Miller Waste Systems
14. David Cote – Loop Mission
15. Belinda Muller – Outcast Foods
16. Steve Capello – Convertus Group

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KEY CONTACTS FOR THIS PROJECT:

HOLLAND MARSH GROWERS' ASSOCIATION

Jody Mott, Executive Director

Email: hmgexec@gmail.com

CJ AGREN CONSULTING

Charles Lalonde, Project Manager

Email: Charles.lalonde73@gmail.com

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