



# Solutions for Plastic Waste in the Holland Marsh

## Project Update

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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 well known for its rich black soil seen along highway 400 north of Toronto. Farms in the Holland Marsh area produce 50% of Ontario's fresh carrots and 60% of Ontario's onions. It is an extremely important production area for Canada's food system. Horticulture production in the Holland Marsh includes growing crops in fields and in greenhouses, packing the products for immediate sale or storage, and processing.

Through this activity there is a tremendous amount of plastic waste generated. Plastic is used for greenhouse and hoop house structures, pots, seedling trays, field plastic, vegetable totes, fertilizer totes, pesticide jugs, bin liners, bags, etc. There are good solutions for some of the plastics used which keep the plastic within the economy longer, but most of the plastic ultimately goes to landfill. This report quantifies the amount of plastic disposed of through Cleanfarms data and actual figures from one large representative packer. Options for waste plastic that currently exist, and potential future options will be identified within five action areas. Some options are available now to farmers. Some options require grassroots or industry-led initiative but are doable in the near term. Longer-term options will need to come through major legislative changes and incentives at the provincial, federal, and global levels to develop a circular economy. These longer-term strategies will ultimately generate sustainable solutions for ag plastics. Industry is at the table working with government on these issues.

# PLASTIC TYPES

Type*	Description <sup>i</sup>	Examples / Purpose	Demand
HDPE – High density polyethylene	Moderately opaque, light weight but extremely sturdy. Food safe.	Garbage bags, pesticide containers and drums, drip tape, pots.	Limited, but markets can be found. Highly recyclable, relatively clean.
LDPE – Low density polyethylene	Very light weight, moderate tensile strength, transparent, good for heat sealing. Food safe.	Food packaging, fertilizer bags, grain bags, silage bags, bunker covers, greenhouse film.	Limited market because it is dirtier. No market incentive as recycled LDPE and virgin pellets are the same price.
LLDPE – Linear low density polyethylene**	Not as strong as HDPE, moderate clarity, cost-effective alternative to LDPE. Food safe.	Food packaging, bale wrap, mulch film.	Limited market because it is dirtier.
PP - Polypropylene	High chemical resistance and strength, high melting point. Food safe. Not breathable and have a longer shelf life.	Food packaging, woven seed bags, pots, twine, greenhouse flooring and hardware, horticulture trays.	Two recycling plants in the USA.
PS – Polystyrene EPS – Expanded polystyrene	Versatile plastic can be made into a variety of forms from hard plastic to lightweight foams. Used in food packaging.	Food packaging, horticulture trays.	
PVC – Polyvinyl chloride	Most used thermoplastic polymer. Can be formed as a rigid or a flexible plastic	PVC piping, horticulture trays.	
PET – Polyethylene terephthalate	Most used plastic packaging material used by the fresh produce industry		Most widely recycled polymer. PET packaging can be manufactured from 100% recycled material <sup>ii</sup> .
PE – Polyethylene			
rPET and other PCR-containing preferred plastics			
Other	Plastics that contain a variety of plastic types.	Net wrap	Non-recyclable.

\*Colours reflect the favourability of plastic choices (regarding packaging) from the CPMA Preferred Plastics Guide. Preferred – green, Minimize – yellow, Unfavourable – red.

\*\* Not part of the CPMA Preferred Plastics Guide as, LLDPE is generally used as films that aren't recycled at the household level, but it is a recyclable material if a recycling program is available.

## INPUT AND OUTPUT WASTE

Input waste is created in the production of vegetables and is managed on farms, greenhouses, and packers. Examples include seed packaging, seedling trays, pots, pesticide jugs, fertilizer totes, mulch film, bin liners, greenhouse film, plastic and nylon bags, greenhouse hardware, etc.

Output waste is created to package and sell vegetables and is managed by wholesalers, retailers, and consumers. Examples include plastic bags for retail, master bags, clam shells, onion bags, bag clips, plastic film, pots, etc. This report focuses on input waste only.

# ISSUE OF PLASTIC

Plastics are a low cost, durable material with unrivalled functionality. They provide significant benefit to the Canadian economy and quality of life. Plastic production and use is growing faster than any other material due to its many practical uses. What makes plastic so valuable also creates major challenges for its end-of-life management. Over half of the disposable plastic products and packaging entering the consumer market are designed to be used once and thrown away. Plastics' durability along with inadequate incentives and infrastructure to recover and recycle this material (globally, only 14% of plastic is collected for recycling and in Canada, only 9% of plastic is recycled.<sup>iii</sup>) is at the root of an exponentially increasing global environmental problem<sup>iv</sup>.

Plastic packaging of fresh vegetables protects the food, extends its shelf-life, and promotes positive behaviour changes e.g. consumption of pre-cut vegetables, bagged salads, etc. The Canadian Produce Marketing Association identified the challenge as, "not the plastic packaging per se; it is the lack of integrated systems that encompass the entire plastic packaging value chain. Packaging has not been designed to ensure its ease of recyclability. The lack of commonly accepted and adhered-to global standards for post-consumer recycled (PCR) plastics, combined with worldwide access to high quality low-priced virgin materials, has discouraged packaging manufacturers from choosing recycled content over virgin."<sup>v</sup>

Horticulture growers and packers within the Holland Marsh rely on plastic materials for many aspects of production and packaging vegetables and greenhouse plants. Plastic is inexpensive, works well, and when it is no longer serviceable, it is relatively easy and inexpensive to dispose of at the landfill. There are some plastic alternatives in use and recycling programs in place that the horticulture industry should be proud of, but there is more work to be done to reduce the environmental footprint.

## REGULATIONS FOR WASTE DISPOSAL

There are minimal regulations regarding waste disposal for farms, greenhouses, and packing plants. Provincial regulations regarding waste audits (O Reg 102/94) or packaging audits (O Reg 104/94) are only required for very large businesses / manufacturing sites, not the farms and packers in the Holland Marsh. Burning plastics is not allowed as per township by-laws, however, a complaint must be made, and immediate investigation done to hold offenders accountable. Fires are allowed (with a permit) to burn clean wood, brush, and vegetable matter<sup>vi</sup>. Burning waste on farms is a common practice in the Holland Marsh. Local landfills operating in York and Simcoe counties will take plastic and other farm waste from farms and packing plants for a relatively inexpensive tipping fee. Packers have contracts with waste management companies to empty farm dumpsters but don't have incentives (positive or negative) to pay for recycling<sup>i</sup>.

The growers, packers, and greenhouse operators interviewed understand that plastic waste is an issue but need system-wide solutions that are economically feasible and convenient.

<sup>i</sup>West Gwillimbury Waste Facility tipping fees \$155 / tonne. Miller Waste tipping fees \$110 - \$120 / tonne depending on the services requested by the contract holder.

# GLOBAL, NATIONAL, AND PROVINCIAL PLASTIC STRATEGIES

The plastic waste generated on Holland Marsh farms, greenhouses, and packing plants is not a problem that an individual farmer can solve. Most farms and the packers are part of a multinational food system that has requirements for food handling, food safety, storage, transportation, pricing, packaging, etc. Farms are affected by federal, provincial, and municipal government structures that make environmental standards and programs, set importing regulations and workplace safety requirements. Farms and packing plants can't simply stop using plastic but by developing systems to support a circular economy, the plastic will remain in the economy longer.

The issue of plastic pollution is being addressed by several global organizations and foundations. Governments, NGOs, industry groups, corporate leaders, consumer groups, researchers, and activists are engaged in finding solutions to plastic pollution. Understanding the direction of these organizations is important for Holland Marsh growers and packers as they consider how to address the issue of plastic waste.

## **OCEAN PLASTICS CHARTER**

In 2018, Canada launched an Ocean Plastics Charter as part of its 2018 G7 presidency. The charter brings together leading governments, businesses, and civil society organizations to support its objectives and commit to taking action to move towards a more resource efficient and sustainable approach to the management of plastics<sup>vii</sup>.

The five action areas include:

1. Sustainable design, production, and after-market use.
2. Collection, management and other systems and infrastructure.
3. Sustainable lifestyles and education.
4. Research, innovation, and new technologies.
5. Coastal and shoreline action.

The action items in the charter are at a higher level than a primary producer can affect, but collectively the industry (horticulture, agriculture, agri-food industry) can align with specific actions. With government support (leadership, policy, and financial), action items within areas one and two could be acted upon by growers and packers.



## STRATEGY ON ZERO PLASTIC WASTE

The Canadian Council of Ministers of the Environment (CCME) published a Strategy on Zero Plastic Waste in 2018. The strategy addresses global environmental priorities that align with the United Nations 2030 Sustainable Development Goals including preventing and reducing marine litter and ensuring sustainable consumption and production patterns. In a December 2021 letter to the new Minister of Environment and Climate Change, Prime Minister Trudeau directs the Minister to deliver on Zero Plastic Waste by 2030<sup>viii</sup>. The strategy has ten priority areas:

1. Product design
2. Single-use plastics
3. Collection systems
4. Markets
5. Recycling capacity
6. Consumer awareness
7. Aquatic activities
8. Research and monitoring
9. Clean-up
10. Global action

Individual growers and packers can make requests and decisions that support the first three priorities, specifically product design, single use-plastics and expanded collection systems. Movement on markets and recycling capacity would allow growers and packers to purchase plastics with more recycled content and when no longer serviceable, the ability to recycle the plastic or recover the energy locally.

From the Strategy on Zero Plastic Waste, two action plans have been published. Action items that could impact the growers and packers include:

1. Facilitate consistent extended producer responsibility programs
2. Develop a roadmap to address priority single-use and disposable plastics
3. Develop national performance requirements and standards for plastics (e.g. recycled content, bio-based plastics)
4. Create incentives for a circular economy
5. Infrastructure and innovation investments.<sup>ix</sup>

## ELLEN MACARTHUR FOUNDATION

The Ellen MacArthur Foundation is a charity committed to creating a circular economy, which is designed to eliminate waste and pollution, circulate products and materials (at their highest values), and regenerate nature. It's an economical system that delivers better outcomes for people and the environment<sup>x</sup>. Plastics and food are two of the areas the foundation is focused on. The Plastics Pact Network, of which the Canada Plastics Pact is part of, works to deliver the common vision of a circular economy for plastics.



## CANADA PLASTICS PACT

Canada Plastics Pact (CPP) is a multi-stakeholder, industry-led, cross value chain collaboration platform which aims to tackle plastic packaging waste and pollution by bringing together businesses, government, NGOs, and other key actors in the local plastics value chain<sup>xi</sup>. CPP partners are working together on achieving the following targets by 2025:

- Defining a list of plastic packaging that is to be designated as problematic or unnecessary and take measures to eliminate them
- 100% of plastic packaging designed to be reusable, recyclable, or compostable
- 50% of plastic packaging is effectively recycled or composted
- 30% recycled content across all plastic packaging.

CPP is a member of the Ellen MacArthur Foundation's global Plastic Pact network and is aligned with their global vision. Actions and solutions are tailored to Canada's unique needs and challenges. Ron Lemaire, president of the Canadian Produce Marketing Association and Ian Gordon, senior vice president at Loblaw Companies Ltd both sit on the board of directors.

## MADE-IN-ONTARIO ENVIRONMENT PLAN – REDUCING THE AMOUNT OF WASTE GOING TO LANDFILL

Ontario is working with the federal government on the development of an action plan to implement a Canada-wide plastics strategy. The strategy will affect industry and residents of Ontario. Municipal blue box recycling programs will begin transitioning to a new extended producer responsibility (EPR) model from 2023 to 2025<sup>xii</sup>. Producers of products and packaging will be fully responsible for managing the life-cycle of their products. The list of materials that can be recycled across the province will be standardized. Common single-use and packaging like products will be accepted. Food packaging bound for consumers (e.g. 2lb carrot bag) will be part of the EPR program. Plastics used in producing the carrots (e.g. seedling trays, greenhouse film) are considered industrial waste and are not part of the program.

Next steps for Ontario include:

- Work with the federal government on compostable packaging, including looking at standards and supporting pilot testing of processing, so that emerging and innovative products and packaging can be managed appropriately in Ontario's existing processing facilities.
- Consult on a proposal to phase out food and organic waste from landfills by 2030 that will focus on building processing capacity in the province.
- Develop and seek input on proposed changes to better define the environmental assessment process for advanced recycling facilities as a method for recovering value from waste and keeping valuable resources out of landfills (e.g. thermal treatments of plastic to create energy).
- Work with partners to conduct audits to identify materials that could be recovered and recycled rather than sent to landfills. Audits would help identify new materials that could be designated under producer responsibility in an effort to recover high volume resource streams to increase diversion and phase out these items from being sent to landfill.
- Explore opportunities to better manage landfills, such as working with industry to better understand any issues, promote best practices to support better management and operation of landfills and improve opportunities for landfill gas capture.
- Cut regulatory red tape and modernize environmental approvals to support sustainable end markets for waste and new waste processing infrastructure, including support for emerging and innovative technologies, such as mixed waste processing<sup>xiii</sup>.



# INDUSTRY PLASTIC STRATEGIES

## CPMA PRODUCE PACKAGING FRAMEWORK

To support the Strategy on Zero Plastic Waste, the Canadian Produce Marketing Association (CPMA) has developed a roadmap to assist the Canadian fresh produce industry in navigating the highly complex, multifaceted topic of utilizing plastic packaging in the most economically and environmentally responsible means possible over the short, medium, and long term.<sup>xiv</sup> There are three pillars to the roadmap.

1

### Standards and Best Practices:

- a. Simplify the types of plastic packaging used by the fresh produce industry. This will help ensure that packaging contains a high percentage of recycled content and ensure that the maximum possible percentage of the chosen packaging is recyclable (or compostable).
- b. Light-weighting
- c. Encouraging consumers to reuse packaging.

2

### Ecosystems and Stakeholders

- a. Canadian retailers should establish packaging protocols that their suppliers must attain.
- b. Packaging manufacturers and fresh produce suppliers should partner with retailers and foodservice operators to reduce the volume of plastic used to package fresh produce.
- c. Work with governments and industry to address challenges with collection systems and infrastructure so that compostable packaging options can be used affordably.

3

### Education

- a. Communicating common standards for post consumer recycled (PCR) materials.
- b. Education and awareness efforts that span the entire plastic packaging lifecycle will be targeted to both industry and consumers. Clear objective messaging regarding the suitability of packaging for recycling or composting, along with the roles and responsibilities for all stakeholders.
- c. Discourage the use of plastics not suited to recycling unless it is a stop-gap solution while alternative materials and systems are in development. (Discouraged materials include PVC, Polystyrene, black and dark coloured plastics, PLA rigid water soluble plastic, Oxydegradable, Polycarbonate and Acrylic.)<sup>xv</sup>

The CPMA has established an active Plastic Packaging Working Group to assist the produce industry in navigating the highly complex goal of utilizing plastic packaging in the most economically and environmentally responsible manner possible.

## LOBLAWS CORPORATE SOCIAL RESPONSIBILITY

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 plastic use and food waste are ranked very high in importance to stakeholders. Targets have been established to address the issues that matter most to Loblaw's stakeholders. By 2025, Loblaw's will ensure all PC® plastic packaging is either reusable or recyclable<sup>xvi</sup>. Other established targets regarding plastic may not currently focus on the produce industry, however progress made in one sector could translate to another sector in time.

## CLEANFARMS

Cleanfarms is an industry developed and funded organization delivering stewardship programs across Canada. They work with sectors and partners in the ag industry to find end-use options for farm waste. Through Cleanfarms, recycling pilots and programs for various types of farm waste operate in individual provinces or communities where there is a need, funding partners, and a viable solution for the waste (e.g. grain bags, bale wrap, etc.).



The Cleanfarms AgRecycling Container Program is a well-established program that is developed, funded, and delivered collectively by the ag industry (farmers, retailers, and input manufacturers). In 2020 Ontario farmers returned 177,000 kg of seed and pesticide bags and 846,000 empty containers.<sup>xvii</sup> Holland Marsh growers will have contributed to this program and use the Bradford Co-op as a container drop off location.

Through funding from Environment and Climate Change Canada, Cleanfarms is leading the development of the Building a Canada Wide Zero Plastic Waste Strategy for Agriculture. This three-year initiative includes a nation-wide ag-waste generation study to determine types and amounts of plastics used on farms across Canada. The goal of the strategy is to increase farmer access to recycling programs and explore ways to deliver long-term permanent programs.

To quantify the amount of plastic waste generated in the Holland Marsh, the results of the Cleanfarms study was used along with the interviews from 10 Holland Marsh growers and packers. The following section highlights the plastic waste profile on Canadian and Ontario farms.

# QUANTIFYING PLASTIC WASTE GENERATION

Cleanfarms published Agricultural Plastic Characterization and Management on Canadian Farms in August 2021<sup>xviii</sup>. The Canada-wide ag waste characterization study focuses on single-use agricultural plastics. The study outlines the types and amounts of agricultural plastics used on farms across Canada through the development of a model to estimate usage rates of various ag plastics based on desktop research, expert interviews, and on-farm practices.

## NON-GREENHOUSE VEGETABLES

Researchers worked with farmers and industry experts to determine the types and amounts of plastics used at each stage of production (seeding, cultivation, pesticide, and fertilizer application) and then applied that methodology to the acres grown (using Statistics Canada data). Researchers considered planting densities and row spacings to determine the total row length for each crop, per acre. This allowed for the researchers to estimate the amount of LDPE mulch film and HDPE drip tape required. Propagation trays were included and adjusted for re-use. LDPE poly film is used for hoop houses and cold frames. Researchers considered the crops that are started by seedlings and correlated the square footage of cold frames or hoop houses to the acreage grown.

## GREENHOUSES PRODUCTION

The methodology used to determine greenhouse vegetable plastic use examined tomato, pepper, and cucumber production only, which accounts for 97% of all units of greenhouse vegetables grown. Propagation greenhouses growing tomato, pepper and cucumber seedlings were included. Structural plastic for greenhouses was included. Black woven polypropylene used for greenhouse flooring was not included in the methodology due to its 10-year lifespan. The top layer of LDPE poly floor film was included as it is replaced annually. Grow bags were not included in the calculation.



## AMOUNT OF PLASTIC WASTE GENERATED BY SECTOR – CANADIAN FARMS<sup>XIX</sup>

Sector	Annual Tonnage (est.) National	% of National Tonnage	Annual Tonnage (est.) Ontario	% of Provincial Tonnage
Field Crops	36,767	59	3,551	26
Non-Greenhouse Vegetables	6,099	10	2,538	19
Greenhouse Vegetables	5,876	9	4,363	32
Pesticide and Fertilizer Packaging	4,761	8	784	6
Fruit, Berries and Nuts	1,665	3	605	4
Maple Syrup	1,661	3	61	<1
Cattle	1,638	3	275	2
Nursery Production and Plants	1,373	2	386	3
Horticulture Flowers and Plants	1,281	2	729	5
Cannabis	633	1	283	2
<b>Total</b>	<b>61,754</b>	<b>100</b>	<b>13,574</b>	<b>100</b>

Ontario's generation of plastic waste by crop type differs significantly from the Canadian totals. Vegetable and horticulture crops contribute to over half of the plastic waste generated on Ontario farms.

## AMOUNT OF PLASTIC WASTE GENERATED BY RESIN TYPE – CANADIAN FARMS<sup>XX</sup>

Resin Type	Annual Tonnage (est.)	% of National Tonnage
LDPE	30,113	49
PP	8,516	14
Mixed Plastics	6,946	11
PS	6,464	10
HDPE	6,127	10
EPS	1,806	3
mPE	1,332	2
PVC	316	1
Nylon	134	<1
<b>Total</b>	<b>61,754</b>	<b>100</b>

Across Canada, almost 50% of the plastics used are LDPE, which is a “favourable” plastic as per the CPMA.

## ESTIMATED GENERATION OF AG PLASTIC – CANADA<sup>xxii</sup>

Resin Type	Annual Tonnage (est.)	% of National Tonnage
LLDPE Bale Wrap	15,055	24
LDPE Grain Bags	6,950	11
Mixed Plastics Net Wrap	6,946	11
<b>PS Trays</b>	<b>6,464</b>	<b>10</b>
PP Twine	5,113	8
<b>LDPE Roof Film</b>	<b>3,766</b>	<b>6</b>
<b>HDPE &lt;= 23L Containers</b>	<b>2,806</b>	<b>5</b>
PP Woven Bags	1,908	3
<b>EPS Trays</b>	<b>1,806</b>	<b>3</b>
<b>HDPE Drums</b>	<b>1,515</b>	<b>2</b>
Metalocene mPE Tubing	1,332	2
LDPE Bags	1,306	2
LDPE Silage Tarps	1,150	2
<b>LLDPE Mulch Film</b>	<b>1,143</b>	<b>2</b>
<b>Greenhouse Hardware</b>	<b>843</b>	<b>1</b>
<b>HDPE Drip Tape</b>	<b>813</b>	<b>1</b>
HDPE IBCs	756	1
<b>PP Pots</b>	<b>641</b>	<b>1</b>
LLDPE Bale Tubes	559	1
PVC Trays	316	1
<b>HDPE Pots</b>	<b>238</b>	<b>&lt;1</b>
LDPE Silage Bags	175	<1
Nylon Fittings	134	<1
PP Film Tear Strips	12	<1
LDPE Tubing	7	<1
Mylar Bags - LDPE and Foil	2	<1
<b>Total</b>	<b>61,754</b>	<b>100</b>

Cleanfarms diverts approximately 6000 tonnes of ag plastics annually across Canada. Remaining plastics are being managed by reuse, on-farm disposal, return-to-vendor, and landfill disposal.

## TYPE AND TONNAGE OF PLASTIC WASTE GENERATED – ONTARIO FARMS<sup>xxii</sup>

Ag Plastic	Annual Tonnage (est.)	% of Provincial Tonnage
PS Trays	2,964	22
LDPE Roof Film	2,277	17
LLDPE Bale Wrap	2,035	15
EPS Trays	1,348	10
PP Twine	916	7
Mixed Plastics – Net Wrap	622	5
Greenhouse Hardware	579	4
HDPE </= 23L Containers	462	3
LLDPE Mulch Film	356	3
PP Woven Bags	312	2
HDPE Drums	312	2
PP Pots	282	2
HDPE Drip Tape	268	2
PVC Trays	197	1
LDPE Bags	173	1
<b>Sub-total of Top 15 Ag Plastics</b>	<b>13,105</b>	<b>97</b>
Other – 11 Ag Plastics	470	3
<b>Total</b>	<b>13,574</b>	<b>100</b>

## ESTIMATED AG PLASTIC PER UNIT OF PRODUCTION: ONTARIO

Sector	Acreage (unless noted)	Annual Tonnage (est.)	Plastic Generated Per Unit (kg/acre unless noted)
Field Crops	8,265,000	3,551	0.43
Cattle	2,051,614 (head)	275	0.13 kg/head
Fruit, Berries and Nuts	43,918	605	13.76
<b>Non-Greenhouse Vegetables</b>	<b>133,395</b>	<b>2,538</b>	<b>19.02</b>
<b>Greenhouse Vegetables</b>	<b>2,970</b>	<b>4,363</b>	<b>1,469.06</b>
Nursery Production and Plants	8,490 (unit)	386	45.48 kg/unit
Cannabis	874	283	323.94
Maple Syrup	1,713,022 (taps)	61	0.04 kg/tap
<b>Horticulture Flowers and Plants</b>	<b>861</b>	<b>729</b>	<b>847.21</b>
Pesticide and Fertilizer Packaging	*9,140,087	784	0.0.09
<b>Total</b>		<b>13,574</b>	

\*Pesticide and fertilizer packaging acreage = the total acreage of all sectors excluding cattle and maple syrup.

Canada generates 61,754 metric tonnes<sup>xxiii</sup> of agricultural plastic waste annually with 13,574 metric tonnes / 22% originating at Ontario farms. Cleanfarms diverted just over 612 metric tonnes of ag plastics in 2021. Ontario's ag plastic waste profile is quite different from the national profile. In-field and greenhouse vegetable production along with horticulture flowers and plants generate a much higher amount of plastic waste compared to field crops. PS and EPS seeding trays make up a combined 32% of the farm plastic used in Ontario and roof film accounts for an additional 17%. In-field vegetable production occurs predominantly in the Holland Marsh, Essex, and Chatham-Kent counties, and in pockets along the Lake Erie shoreline. Most of the greenhouse production occurs in Essex, Kent, and Lambton Counties but there are some greenhouse acres in the Holland Marsh as well.

## **PLASTIC WASTE GENERATION ON FARMS, GREENHOUSES, AND PACKERS**

Holland Marsh farms, greenhouses, and packers use a variety of plastic types and items to produce, pack, and store vegetables. Plastic is used for the structure of large greenhouses and small hoop houses, on fields to protect crops, to grow and transport seedlings, to grow and sell greenhouse plants and vegetables, in packaging of imported vegetables that are re-packed in Ontario, to pack Ontario grown vegetables, to transport crop input supplies, to hold vegetables at harvest and to protect the health and safety of workers. The plastic materials used contribute to food safety, biosecurity, health and safety, and food security. Plastics allow for a greater variety of crops to be produced, year-round production of greenhouse vegetables and flowers, and increase the amount of locally produced, healthy, and affordable food.

In Ontario, 56% of the agricultural plastic waste is generated from in-field vegetable, greenhouse vegetable, and horticultural flower and plant production. The Holland Marsh is one of a few areas in Ontario that has intensive vegetable production. Most of the Holland Marsh vegetables are grown in fields, but some greenhouse production occurs, and many field vegetable producers start their seedlings in greenhouses or hoop houses.

The Cleanfarms study results are not at the township or county level, so it is unknown how much of Ontario's ag plastic waste is generated in the Holland Marsh but reviewing the types of plastic and amounts of plastic used by the vegetable and horticulture sectors illustrates the size of the plastic issue within the ag industry in Ontario. The Cleanfarms data doesn't include plastic waste generated through packing vegetables, flowers, and plants. Fortunately, one large grower / packer measured their plastic waste for three years in hopes to find a recycling solution. They generated 40 tonnes of baled plastic waste per year. The 40 tonnes included plastics used in vegetable production, packing vegetables, off season imports and bale wrap for their cattle operation.

Based on the interviews with 10 Holland Marsh producers (growers, packers, greenhouse growers), each operation makes use of the recycling programs available to them (e.g. Cleanfarms container recycling, returning seedling trays to Keller Bros). They are willing to participate in recycling programs if they are well designed, convenient, and affordable. Growers and packers are paying for waste removal through tipping fees with waste management companies. They recognize that their businesses generate waste and are looking to minimize their environmental footprint through many initiatives including recycling, composting, reducing inputs, reusing inputs, improving storage conditions, wastewater treatment, finding markets for cull vegetables, and choosing preferred waste disposal options. The growers and packers interviewed are looking for economical programs to minimize environmental impacts so that their business remains viable and competitive with growers and packers locally and in other jurisdictions.

There are six large vegetable packing operations and a few smaller packers. To estimate the quantity of plastics used at grower / packer operations, 40 tonnes per year multiplied by 6.5 grower / packers = 260 tonnes of plastic waste per year.

# ADDRESSING PLASTIC WASTE IN THE HOLLAND MARSH

There is no one solution to plastic waste in the Holland Marsh. Product design, assessments, promoting good practices, diversion programs, and systems, regulations, and incentives to support a circular economy all play a role in addressing plastic waste.

## 1

### PRODUCT DESIGN

Products need to be designed with consideration to their full lifecycle. Can the product be reused, refurbished, easily recycled, or composted? Plastic field mulch is used on some farms in the Holland Marsh for fruit, vegetable, and leafy greens production. The plastic can warm the soil and reduce weed and pest pressure. Biodegradable mulch films are available, but most producers still purchase the conventional plastic. In 2021, Bradford Co-op sold:

Product	Amount Sold	Cost Per Linear Foot*
Conventional mulch film	126 rolls*	\$0.0656
Biodegradable mulch film	4 rolls	\$0.0685

\*2021 pricing. \*\*includes 48", 60" and 72" wide rolls

The cost difference between the bioplastic and the conventional plastic film is negligible, so why aren't growers choosing the more environmentally friendly option? Is this an issue of product functionality, marketing, or a lack of incentives encouraging growers to make more sustainable choices? Identifying the issue and then working with researchers and / or manufacturers and marketers could lead to increased adoption.

#### Bioplastic Films

Continued research on bioplastics is being done by Dr. Erica Pensini at the University of Guelph. She is developing films for agricultural applications including mulch films and bale wrap. OMAFRA and the Arrell Food Institute fund her research. More information is available at [www.uoguelph.ca/engineering/epensini](http://www.uoguelph.ca/engineering/epensini).

#### Bioplastic Tomato Clips

Dr. Manjusri Misra is developing bioplastic tomato clips for greenhouse tomatoes. Each tomato vine uses approximately 20 polypropylene clips to attach the vine to the trellis. It is not economical to remove the clips when the vines are being replaced so the entire plant, along with the clips go to landfill instead of being composted. The bioplastic clips will be completed and available this year (2022). The clips will have applications for cucumbers and other trellised greenhouse crops. Dr. Misra is also doing research on bioplastic films and pots. She is happy to add Holland Marsh Growers as a partner. Funding for this research is through OMAFRA (Gryphon's Lair), AAFC, and Competitive Green Technologies. More information is available at [www.uoguelph.ca/engineering/people/manjusri-misra-phd](http://www.uoguelph.ca/engineering/people/manjusri-misra-phd).



## **Biodiffusion Technologies**

BioFusion is a resin-based product on the cusp of the marketplace with many possible applications. It can be sprayed on materials to create a biodegradable coating. Depending on the application needs, it can be applied to create a thick or thin coating. A small trial was completed in 2021 to assess BioFusion as a field cover to prevent erosion and as a plastic mulch. Funding has been received for a larger field trial in 2022. More testing needs to be done to assess applications, but it could be a solution in the future. More information is available at [tyler@agtechsolutions.ca](mailto:tyler@agtechsolutions.ca).

# 2

## **ASSESSMENTS AND AUDITS**

Assessments and audits can identify the who, where, what, when, why and how of waste creation on farm and within the industry. Assessments can be done formally and informally at the farm level or industry level.

### **Individual Assessment**

Taking time to assess plastic use on farm and consider how to reduce, reuse, repair, recycle or recover the plastics used can lead to a reduction in waste generated. This could include ensuring recycling programs are used, choosing suppliers that recycle trays and films, paying for recycling service instead of landfill tipping fees, choosing bioplastic product options where available, and training staff on the environmental expectations of the farm.

### **Industry Assessment**

A couple of the packers interviewed for this project identified inter-provincial trade regulations as a cause of unnecessary plastic waste. Large packing plants import vegetables in the off-season to package under their brand to ensure a year-round supply to their customers. They have relationships and contracts with farms in the United States and Mexico to supply vegetables. The trade regulation is worded / interpreted in such a way that bulk shipments of vegetables are not allowed if another province still has supply but importing units of 50 lbs or less is allowed. Therefore for a few months each year, vegetables are imported in unnecessary plastic packaging rather than arriving in bulk containers. The industry could work with governments to address inter-provincial trade legislation that inadvertently leads to plastic waste when vegetables are imported by Ontario packers.

### **Professional Assessments and Audits**

Anthesis Provision (formerly Provision Coalition) is a consulting company focused on sustainability in the food sector. They work with food companies including farms, packers, and greenhouses to assess and prevent waste creation, re-build supply chains, and build circular economies. Larger operations could work with Anthesis Provision to address both plastic and food waste. More information is available at [www.provisioncoalition.com](http://www.provisioncoalition.com).

Miller Waste Systems is a waste management company used by some growers and packers. They (and other waste management companies e.g. GFL Environmental) facilitate waste audit services to help customers assess the best options for the waste generated and then design diversion and disposal programs to meet the needs of the operation. Miller Waste has sorting, recycling, composting, and anaerobic digesting capability for a wide variety of materials. Some "waste" materials have enough value to generate a rebate for the customer. There are costs for waste audits and diversion programs but there are also costs to landfill waste. As more stringent regulations around waste generation are introduced, there will be greater incentive to develop diversion programs. More information is available at [www.millerwaste.ca](http://www.millerwaste.ca).

## 3

### PROMOTE SUSTAINABILITY EFFORTS

Highlighting good stewardship initiatives being done by Holland Marsh growers, packers, suppliers, and service providers can encourage change by others and promote the industry. Including stories about recycling seedling trays with Keller Bros Greenhouses, a grower's experience with biodegradable field mulch, and a grower recycling hoop house film through Switch Energy may provide the information needed and the nudge to inspire other growers to make positive change.

## 4

### EXISTING DIVERSION PROGRAMS

Diversion programs are a critical component in managing plastic waste. Increasing participation and building on existing programs or models is the easiest short-to-medium-term solution for diverting plastic from landfill.

#### **Cleanfarms**

Cleanfarms coordinates an industry-designed recycling program for pesticide, fertilizer, and seed containers, pails, drums, totes, and bags. The permanent program is funded through industry with the costs being incorporated into the price of the original products. There is no additional charge to farmers returning their containers. Ag retailers act as return depots throughout the year. Cleanfarms collects the plastic containers and sends them for recycling. This is a well-established program operating across Canada with good uptake among farmers. The Bradford Co-op is a return location in the Holland Marsh. More information is available at [www.cleanfarms.ca](http://www.cleanfarms.ca) or [www.bradfordcoop.ca](http://www.bradfordcoop.ca).

#### **Switch Energy Corp.**

Switch Energy is a Clinton Ontario company collecting LDPE and LLDPE plastic films used in agriculture. Items include greenhouse film, pallet liners, master bags, bale wrap, silage film, ag-bags, salt bags, and fertilizer bags. Plastic types must be separated. Switch Energy provides the farm with 15 empty bags. When the bags are full, the farm requests a pick-up. Cost is \$90 per pick-up anywhere in Ontario. The plastic is prepared for shipping and sent for recycling. Due to the volatility of the recycling market, several end markets have been used over the years. Currently product is being sent to the United States. Approximately 2100 farmers use the service and new customers are welcomed. More information available at [www.switchenergycorp.com](http://www.switchenergycorp.com) or [dnott@switchenergycorp.com](mailto:dnott@switchenergycorp.com).

#### **U-Pac Agri Service**

U-Pac Agri Service coordinates a grassroots initiative to recycle bale wrap and silage film in Prince Edward and Leeds Grenville Counties. U-Pac has designed and sells plastic compactors to create bales of plastic. Farmers in these counties have purchased the compactors (\$900) and bale their own plastics as per the program requirements which include separating the plastics, drying it, removing caked on materials, and storing in on a pallet in a dry location. When 50 bales of plastic have been accumulated across the two counties, U-Pac schedules a collection day. County Farm Centre in Picton has volunteered their yard, loading dock, forklift, and forklift operator to load the tractor trailer. The recycling company pays to transport the plastic to their London Ontario plant. U-Pac has been involved with helping other farm organizations and groups of farmers learn about or establish recycling initiatives and is willing to meet with Holland Marsh growers. More information is available at [upacagriservice@gmail.com](mailto:upacagriservice@gmail.com).

#### **Cleanfarms – Bruce County Pilot**

Cleanfarms is currently running a three-year recycling pilot in Bruce County for twine, bale wrap, and silage film. Producers can pick up large collection bags at four sites and then return them filled to be sent for recycling. The plastic types must be separated. There is no cost to producers. More information is available at [www.cleanfarms.ca](http://www.cleanfarms.ca).

### **Keller Bros Greenhouses**

Keller Bros supplies vegetable seedlings to many farms in the Holland Marsh. Growers who purchase their seedlings through Keller Bros can return the empty PS trays when deliveries are made. Keller Bros ships the trays to Antek Madison in Toronto. The trays are re-grinded into clean pelletized post-consumer resins. There is no additional cost to growers. More information is available at Keller Bros Greenhouses 519-326-1991.

### **Excalibur Plastics Ltd.**

Excalibur Plastics is a Leamington Ontario company specializing in greenhouse plastics. They outsource the installation of greenhouse structures. The installation company they use bales the plastic from the old structure and sells it for recycling. More information is available at [www.excaliburplastics.com](http://www.excaliburplastics.com).

### **Northern Caucus of the Ontario Federation of Agriculture and the Northern Ontario Farm Innovation Alliance**

Farmers in Northern Ontario (Muskoka to Kenora) can participate in a two-year pilot program (2020 – 2022) to recycle twine, bale wrap, and silage film. Producers are using plastic compactors (from U-Pac) to bale plastic. Farmers will be asked to transport plastic to central locations for a collection blitz. No collection has occurred yet. Plastic will be sent for recycling or energy recovery. More information is available at [www.nofia-agri.com](http://www.nofia-agri.com).

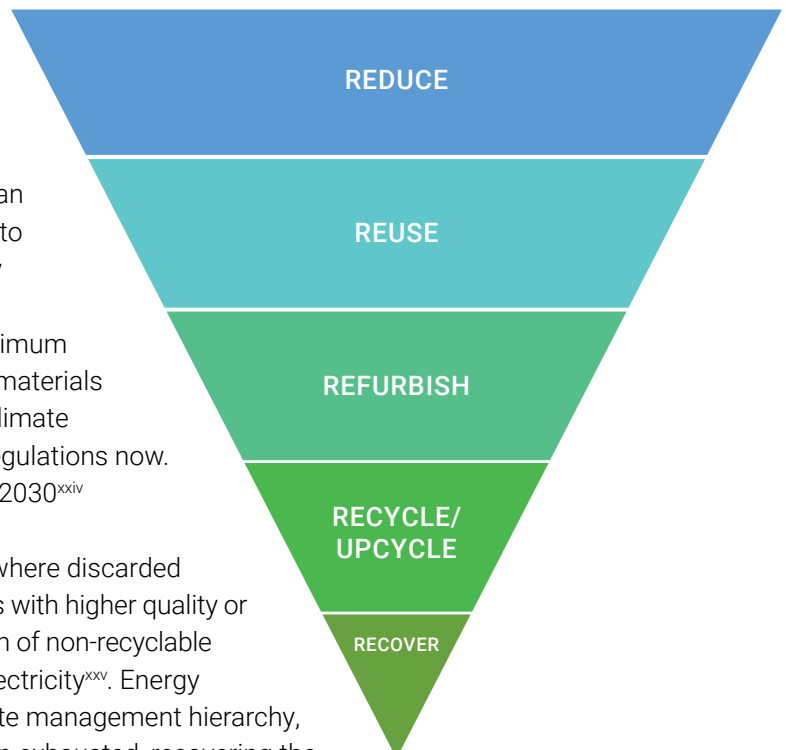
## 5

### **SYSTEMS, REGULATIONS, AND INCENTIVES FOR A CIRCULAR ECONOMY**

For governments to deliver on the zero plastic waste strategy and other global commitments (UN Sustainable Development Goals, Ocean Plastics Charter, Canada Plastic Pact and Glasgow Climate Pact), a circular economy must be developed. This requires systems supported by regulations and incentives. Leaders in agriculture need to work with government to ensure policy regulations support a strong, sustainable agriculture industry in Canada.

One of the challenges with expanding current or developing new diversion programs for ag plastics has been the lack of stability of end markets. In a circular economy, products that can no longer be reused or refurbished go to recycling, upcycling, or waste recovery markets. For stable recycling markets, government needs to regulate the minimum recycled content levels in new plastic materials to create demand. Environment and Climate Change Canada is developing these regulations now. The target is 50% recycled content by 2030<sup>xxiv</sup>

Upcycling is a relatively new concept where discarded materials are reused to create products with higher quality or value. Energy recovery is the conversion of non-recyclable materials into energy e.g. heat, fuel, electricity<sup>xxv</sup>. Energy recovery sits at the bottom of the waste management hierarchy, but when all other strategies have been exhausted, recovering the energy from plastics is a good solution.



Recycling programs require plastics to be clean, dry, and sorted into a single plastic type. Ag plastics are often dirty and wet, and some products are made of mixed plastics (e.g. onion bags) which can't be recycled. In general, energy recovery is less picky about the plastic feedstocks than a recycling operation, making it a good solution for some ag plastics. Energy recovery isn't a new concept, but it isn't widely used in Ontario yet.

Recent changes to O. Reg 79/15 have made it easier for energy-intensive facilities to substitute coal and petroleum coke with alternative low-carbon fuels<sup>xxvi</sup>. In many cases ag plastics are not recyclable but could be used as an alternative fuel source. Creating standards for solid recovered fuels along with government support for both innovation and infrastructure, especially to commercialize and scale up new technologies will help create high volume recovery options<sup>xxvii</sup>.

### **End Markets – Recycling and Upcycling**

The following companies are using “waste” plastics as a feedstock to produce new products or chemical components. While these companies require an intermediary to collect and pre-process the plastic waste to meet their requirements, they could be part of the solution to manage agricultural plastic waste in a sustainable way.

#### **Aduro Clean Technologies**

Aduro's chemical conversion technology transforms plastic waste into valuable feedstocks that may be used in production of new plastics or transportation fuels<sup>xxviii</sup>. Hydrochemolytic™ Technology activates unique properties of water in a chemistry platform that operates at relatively low temperatures and cost. Plastics can be sorted or mixed. Aduro Clean Technologies is establishing a pilot plant in Sarnia Ontario which will be operational in early 2023. They are working with Switch Energy to supply ag plastic waste as a feedstock. Aduro's mission is to establish small modules near waste creation centres (industry and municipal) to reduce the demand for petroleum and the environmental load of waste materials going to landfill. This technology upcycles plastic waste and can be revenue stream. The pilot plant being established will process 2-4 tonnes of plastic per day, but larger or smaller plants can be designed. Aduro is interested in working with Holland Marsh growers. More information is available at [www.adurocleantech.com](http://www.adurocleantech.com) or [ovicus@adurocleantech.com](mailto:ovicus@adurocleantech.com).

#### **GreenMantra Technologies**

GreenMantra upcycles hard-to-recycle plastics into specialty waxes and polymers used in asphalt roofing, asphalt roads and plastic processing composites. Their speciality polymers are 100% recycled content. They are a growing Brantford Ontario company that has been in business commercially since 2016. GreenMantra buys pre-processed plastic (separated and pelletized) from intermediaries who are collecting plastics through private industry and municipalities. They are currently using mainly polypropylene but have other formulas that use polyethylene. More information is available at [www.greenmantra.com](http://www.greenmantra.com) or [steve.higgins@greenmantra.com](mailto:steve.higgins@greenmantra.com).

### **End Markets – Waste Recovery**

The following companies are in or entering the waste recovery sector and could be end solutions for mixed and dirty plastic generated through agriculture and food production. Waste management companies and industry diversion programs could expand offerings using energy recovery when recycling isn't an option.

#### **Bradam Energies**

Bradam Energies has a technology to convert non-recyclable plastics and organic material to electricity, synthetic natural gas, hydrogen, or biofuels<sup>xxix</sup>. They use a carbon energy recovery (CER™) process which has much lower emissions and produces a higher quality of syngas than incineration, gasification, or pyrolysis. The products of the CER process are energy, water, clean inert aggregate, heat, and fertilizer.

Nothing ends up in landfill. Bradam is building a plant in Hamilton, scheduled to open in June 2023 and has three other plants planned for Ontario, two of which will be in the Toronto area. They are looking for public-private partnerships to build modules for communities / sectors that can supply the waste and use the end products. More information is available at [www.bradamenergies.com](http://www.bradamenergies.com) or [rickf@bradamenergies.com](mailto:rickf@bradamenergies.com).

### **BBL Energy**

BBL has a gas to liquid (GTL) technology to process waste into ultra low sulphur diesel fuel. Mixed plastics are good feedstocks for the process which eases the burden of separating plastics on-farm. The BBL plant located in eastern Ontario has recently been sold and the GTL equipment decommissioned, but they are working on establishing another project in Ontario, potentially creating an option for the future. More information is available at [www.bblenergy.com](http://www.bblenergy.com) or [brett@bblenergy.com](mailto:brett@bblenergy.com).

### **Cement Industry in Ontario and Geocycle Canada**

Ontario has a very large cement industry, producing 50% of the cement manufactured in Canada. Cement manufacturing is a very emissions-intensive process. The Canadian cement industry is working to lower their carbon emissions by up to 40% by 2030 and deliver net-zero concrete by 2050<sup>xxx</sup>. One way to reduce CO2 emissions is to switch from using coal and petroleum coke (petcoke) to lower-carbon alternative fuels to fire the kiln<sup>xxxi</sup>. In December 2021, changes were made to O. Reg 79/15 making it easier for energy-intensive facilities to substitute coal and petroleum coke with alternative low-carbon fuels<sup>xxxii</sup>. Among the best alternative low carbon fuels are those derived from the waste stream including agricultural waste, non-recyclable plastics and construction and demolition waste. These recovered fuels play an important role in the circular economy by displacing virgin fossil fuels with recovered material otherwise destined for landfill or incineration<sup>xxxiii</sup>. This regulatory change could be a great end solution for hard-to-recycle plastic waste generated through agriculture.

Companies such as Geocycle Canada work with waste producers and waste processors (e.g. cement kiln) to find zero landfill solutions for waste in a safe, efficient, and sustainable manner<sup>xxxiv</sup>. Independent recycling companies bring shredded waste (e.g. demolition materials, hard-to-recycle plastics, roof shingles, etc.) to the cement plant to fuel the kilns. They pay tipping fees that are significantly less than landfill fees (~\$30-\$50 / tonne). Waste materials are added to the kiln specifically to ensure that there is no waste at the end of the process. The resulting ash becomes an ingredient in creating high quality clinker. Geocycle is governed by LaFargeHolcim, and they are located at the LaFargeHolcim plant in Bath Ontario.

ACES Waste Management (Muskoka) collects, shreds, and transports waste materials to Geocycle. There are costs for ACES' service and Geocycle's tipping fees, so this is not an economical solution today, but the landscape for waste is changing. Could an EPR model support these costs in the future? Will landfill tipping fees increase to a point where sustainable options including Geocycle are the more economical solution? Will demand for plastic "waste" increase to where there is value in the plastic and Geocycle would pay for it? Geocycle is willing to do a free analysis on the Holland Marsh plastics to assess their suitability for the kilns. More information on Geocycle is available at [www.geocycle.com/canada](http://www.geocycle.com/canada) or [shiv.sharma@geocycle.com](mailto:shiv.sharma@geocycle.com).

## SHORT-TO-MEDIUM-TERM OPPORTUNITIES TO MANAGE PLASTICS

With over 700 farms in the Holland Marsh and surrounding areas and multiple plastic types and forms, there is no single solution to plastic waste. Some opportunities can be done individually, and other options required a collective effort. The following options below are actions grower, packers, and the industry could undertake to manage ag plastics. Some options can be achieved individually, others require a collective effort led by either a grassroots or industry initiative.

- Growers and packers can review the available options for recycling through their industry and in the community. Completing a waste generation assessment either independently or through a service provider or professional consultancy can identify issues and opportunities. Growers and packers can implement the best options that are currently available (e.g. waste reduction strategies, existing return-to-vendor programs, recycling services, staff training, etc.).
- The HMGA could highlight good sustainability initiatives being done by growers, packers, and service providers. The information and public accolades can encourage others to make sustainable changes.
- HMGA, Cleanfarms, and the Bradford Co-op could use existing communication channels to promote the Cleanfarms container recycling program to Holland Marsh growers. Start an initiative to be the depot that collects the highest percentage of containers in the country.
- The HMGA can build a relationship with Cleanfarms and look for funding to develop a Cleanfarms micro-pilot collection program for farm plastics used in the Holland Marsh e.g. PS trays or greenhouse film.
- The packers could lead a grassroots collection effort to recycle or recover plastics (e.g. field plastic, greenhouse film, bags, and pallet liners) based on the U-Pac model. U-Pac Agri Service is willing to consult with a group of growers and packers on how to establish a plastic collection and recycling initiative. The costs are very low for this activity and the packing plants are well-suited to coordinate this activity. See Appendix A for specific details.
- HMGA could look for funding to establish a pilot program to collect greenhouse film, field plastic, and master bags through Switch Energy to upcycle through Aduro Clean Technology. A project could support sustainability objectives, study collection methods and grower willingness to participate, and showcase new green technology.



# LONG-TERM STRATEGIES FOR MANAGING PLASTIC WASTE

Sustainable farming and business practices will be a requirement for Ontario and Canada to meet their strategies on climate change and zero plastic waste. Regulatory changes are being made to help drive change to a circular economy for plastics. The visible impacts of climate change (atmospheric rivers, wildfires, extreme temperatures) further the resolve of government to make positive change. The following are long-term initiatives for the industry and growers to monitor.

- Continue to support academic and industry-lead research on bioplastics, packaging, energy recovery and other sustainable concepts that will support the vegetable industry.
- Work with government to amend inter-provincial trade regulations resulting in unnecessary plastic.
- Engage with companies developing and using upcycling and energy recovery technologies that could use ag plastic.
- Work with government and industry leaders to move forward on the regulations and incentives required to develop a circular economy for plastic.

## CONCLUSION

In-field and greenhouse vegetable production and horticulture flowers and plants generate 7630 tonnes equaling 56% of the agricultural plastics used in Ontario<sup>xxxv</sup>. It is estimated that packing plants in the Holland Marsh generate an additional 260 tonnes of plastic waste per year. Sustainable farming and business practices will be a requirement for Ontario and Canada to meet their strategies on climate change and zero plastic waste. The Holland Marsh is located at the top of the Greater Toronto Area, the most densely populated place in Canada. Field plastics, dilapidated hoop house structures, stacks of plastic crates and burn barrels in use are easy to see when driving through the marsh. Addressing plastic waste in a sustainable manner is required to protect the reputation of Holland Marsh growers and packers and promote the products locally, across Canada and to international markets. There are good solutions available to growers and packers for some ag plastics. Industry-led and/or grassroots initiatives could be developed based on existing models to address other plastics e.g. films. Working together with industry and government partners to develop regulations and incentives for a circular economy for plastics will create more options for recycling, upcycling, and energy recovery with ag plastics.

# APPENDIX A

## ESTABLISHING A GRASSROOTS RECYCLING PROGRAM

U-Pac Agri Service runs a grassroots bale wrap recycling program for livestock producers in Prince Edward and Leeds Grenville Counties. Interested producers in that area have purchased plastic compactors designed and sold through U-Pac to collect their bale wrap and compact it into plastic bales weighing 900 – 1000 lbs. U-Pac has established a relationship with a London Ontario company to recycle the bale wrap into plastic lumber. U-Pac coordinates the pick-up day with the recycling company, the farmers, and a local farm supply store to host the bale drop off / pick-up. The recycling company pays for the transportation of the plastic from the central location to the recycling plant. Farmers only pay for purchasing the compactor and the cost of delivering the bales to the central location. The compactors cost less than \$1000, are easy-to-use, and are powered using a tractor.

The HMGA could support a grassroots project to collect and recycle ripped plastic bags, master bags, pallet liners, greenhouse film, and potentially field plastic. The large grower / packer operations would need to support the initiative by purchasing the plastic compactors <\$1000, allowing staff to be trained on acceptable plastic types and using the compactor, storing the plastic bales properly, delivering the plastic bales to a central location on the collection day. Ideally one packer would volunteer to host the collection day which would include the use of their loading dock, forklift, and forklift operator time to load a tractor trailer with plastic bales.

The project should include:

- Consulting through U-Pac to assess the suitability of the types and conditions of the plastics used in the Holland Marsh to determine which plastics to collect.
- Consulting through U-Pac to facilitate the relationship with the recycling company.
- Funding to cost-share 20 plastic compactors for 10 grower/packer operations.
- Funding to develop a training video on what plastics are collected, drying, operating the compactor, and storing the bales.
- Time for workers to attend a 1-hour training session.
- Consulting time to develop and deliver on a communication plan for the collection day.
- Funding to develop a short video featuring the growers/packers on the collection program discussing how this aligns with their sustainability goals on their farms and for the industry.
- Consulting time to coordinate the collection days.
- Host four collection days over a period of two years to encourage program awareness and create desire for a continued program. Depending on plastic volume either one or two loads of plastic being delivered to the recycler on the collection day.
- Consulting to report on collection program results and learnings for industry to build from.

One large grower/packer interviewed had measured plastic waste at 40 tonnes per year. One 53' tractor trailer can carry 50 bales of plastic weighing 900 to 1000 lbs. If all their plastic waste generated could be recycled, they could send two trailers of plastic bales to be recycled each year. Not all plastic items will be accepted for recycling, but this gives an idea of how much plastic is generated through large grower/packer operations. There are six large grower/packer operations and three small grower/packer operations. A reasonable estimate of the plastic generated at grower/packers in the Holland Marsh is:

40 tonnes x 6.5 packer / growers = 260 tonnes.



# 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
11. Paul Keller – Keller Bros Greenhouses (seedling supplier for HM Growers)

### 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. Carly Fraser and Kim Timmer – Cleanfarms
4. Anna Crolla – OMAFRA
5. Steve Law – Ministry of the Environment, Conservation and Parks
6. Simone Weinstein – Provision Coalition
7. Tyler Whale and Phil Richardson – Biodiffusion
8. Don Nott – Switch Energy
9. Rick Finkbeiner – Bradam Energy
10. Matt Shepard – Bradford Co-op
11. Lynn Leavitt – U-Pac Agri Service
12. Brett Lawson – BBL Energy
13. Catherine Abel – Canadian Stewardship Services Alliance
14. Manjusri Misra – University of Guelph – Bioplastics Engineering
15. Erica Pensini – University of Guelph – Bioplastics Engineering
16. John Van De Vegte – OMAFRA
17. Adam Auer – Cement Association of Canada
18. Shiv Sharma – Geocycle Canada
19. Ben Scott and Steve Higgins – GreenMantra
20. Ofer Vicus – Aduro Clean Tech
21. Emily Seed – Northern Ontario Farm Innovation Alliance
22. Tim Vanderkooy – Ontario Plants Propagation
23. Sean McCutcheon – Miller Waste Systems

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