Northern Ontario Agricultural Plastics Disposal Assessment

In Partnership with NOFIA

Northern Ontario Farm Innovation Alliance

April 2018

Background

In response to the plastic disposal challenges affecting farmers in Northern Ontario, NOFIA requested a study to:

- Quantify the volume of farm generated plastic waste
- Understand the end-of-life options for these materials
- Identify the available destinations for recovering value from these materials
- Assess the cost framework for managing these materials

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Assessment Design and Objectives

Step 1 – Assess the types and volumes of agricultural plastics generated in Northern Ontario

Step 2 – Determine how to strategically address this material – from generator to processor

Step 3 – Determine end-of-life options for key materials

Step 4 – Build a cost framework

Step 5 – Identify the opportunities of an Extended Producer Responsibility framework for assisting with these materials

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Waste Characterization and Volume Assessment

Key question:

- what are the main types and volumes of ag plastic waste?
- start with what you know!
  - 2016 farm census data
  - Four key sectors
    - Major field crops
    - Livestock
    - Major fruit crops, and
    - Major vegetable crops.
  - Crop input based assessment process

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Volume Assessment- continued

Industry and Northern Ontario Input

- industry sources,
- crop experts,
- published academic research,
- standard industry practices,
- interviews with product experts, farmers and associations representatives.
- previous waste characterization studies were also referenced to identify waste production factors and metrics
- Northern Ontario farmer survey

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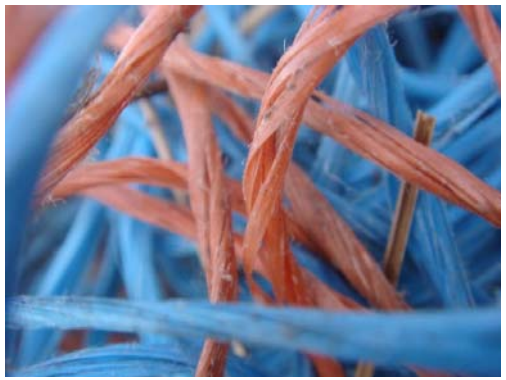
Agricultural Plastic Types

- **Polypropylene (PP, Type 5)** – products include: monofilament and braided baling twines, net wrap and woven fibre supersack bulk bags and sacks.

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Agricultural Plastic Types

- **Low density polyethylene (LDPE, Type 4)** – products include silage and bunker covers, and silage and grain bags

Low density polyethylene (LDPE, Type 4)

Agricultural Plastic Types

- **Linear Low-Density Polyethylene (LLDPE, Type 4)** – products include bale and silage wrap

Linear Low density polyethylene (LLDPE, Type 4)

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Agricultural Plastic Types

- **High density polyethylene (HDPE, Type 2)** – products include <23L jugs, drums and IBC containers.

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Major Agricultural Plastic Waste Volume Per Sector

Farming Sector	Tonnes/Year	Comments
Major Field Crops	788	All categories included.
Livestock	23	All categories included.
Major Fruit Crops	4	All categories included.
Major Vegetable Crops	4	All categories included.
Total:	819	

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Select Agricultural Plastic Waste Volumes

Farming Sector	Tonnes/Year	Comments
Major Field Crops	695	included: bale/silage wrap, silage bags and silage/bunker cover, twine and net wrap excluded: seed bags, fertilizers and pesticides. (EPR)
Livestock	10	included: feed bags; excluded: sanitation products. (R2R, reuse, Blue Box)
Major Fruit Crops		Entire category excluded due to low volumes
Major Vegetable Crops		Entire category excluded due to low volumes
Total:	705	Combined total tonnes of select plastics available for collection in Northern Ontario

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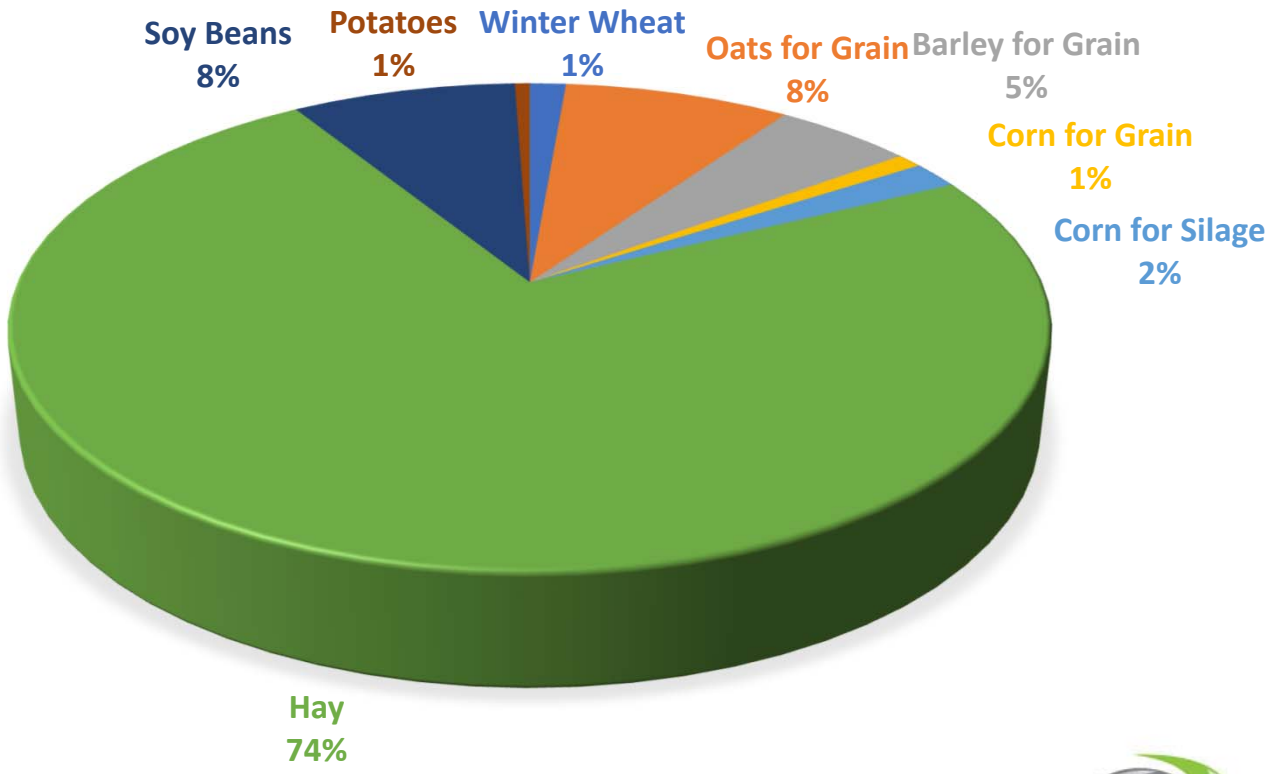
Major Field Crop Distribution



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Major Field Crops Plastic Waste Summary

Major Field Crops Plastic Waste (tonnes per year)	PP woven bags	HDPE containers	LDPE film	LLDPE film	PP twine	PP Net Wrap
Small and Large Seed Bags	8					
Fertilizer Jugs, Drums and IBCs		53				
Pesticide Jugs, Drums and IBCs		32				
Silage/Grain Bags, Silage/Bunker Cover			6			
Bale and Silage Wrap				519		
Net Wrap						48
Baling Twine					122	
Total	8	85	6	519	122	48
Managed		93				
Unmanaged Major Field Crops Plastic Waste						695

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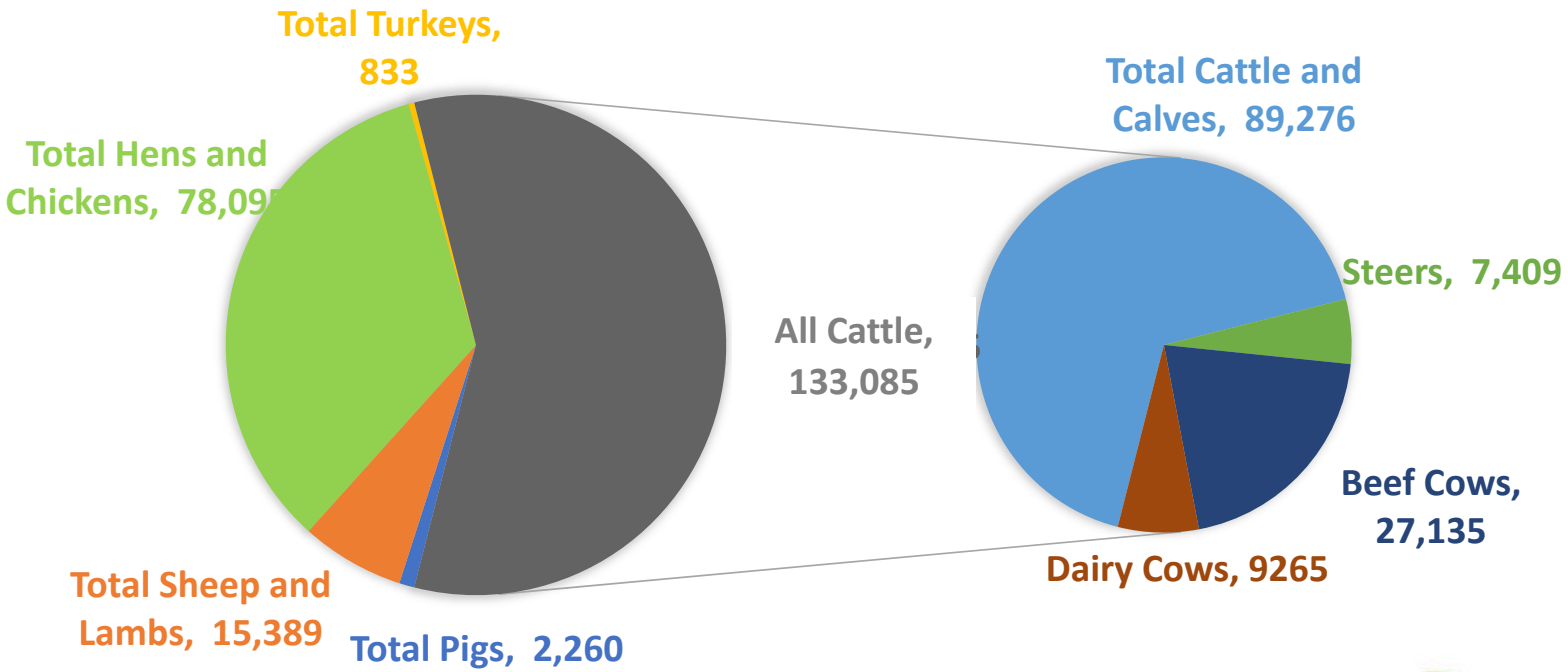
Livestock Distribution



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Livestock Plastic Waste Summary

Livestock Plastic Waste (tonnes per year)	HDPE containers	PP woven bags
Small and Large Feed Bags		9.5
Sanitation Jugs, Drums and IBCs	13.7	
Managed	13.7	
Unmanaged Major Field Crops Plastic Waste		9.5

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5 Year Growth in Plastic Waste Volumes

Change in Size	# of Farms Score (1:1)	Average Change	Weighted Score
Decrease	**3**	**↓ 20%**	2.4
Increase	**49**	**↑ 32%**	64.7
Same	**42**		42.0
Total Score	**94**	**A B**	109
Rate of Change ((B/A)-1) x 100			16%

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5 Year Growth in Plastic Waste Volumes

Farm Sector	2017	2018	2019	2020	2021	2022
	Base Year	3.0%	3.0%	3.0%	3.0%	3.0%
Field Crop Waste	(tonnes/year)	Year 1	Year 2	Year 3	Year 4	Year 5
PP woven bags	8	8	8	8	8	9
HDPE Containers	85	88	90	93	96	99
LDPE Film	6	6	7	7	7	7
LLDPE Film	519	534	550	567	584	601
PP Twine	122	126	129	133	137	141
PP Net Wrap	48	50	51	53	55	56
Total Plastic	788	812	836	861	887	914
Total Unmanaged Field Crop Plastic	**695**	**716**	**738**	**760**	**783**	**806**
Livestock Waste						
PP Woven Bags	10	10	10	10	11	11
HDPE Containers	14	14	15	15	15	16
Total Unmanaged Livestock Plastic	**10**	**10**	**10**	**10**	**11**	**11**
Total Plastic	**811**	**836**	**861**	**887**	**913**	**941**
Total Unmanaged Plastic	**705**	**726**	**748**	**770**	**793**	**817**

What Next?!

- We have What, How Much and Where figured out…
- So where do we send it, now that we know what “it” is?
- Three main destinations:
  - Landfill – that’s not sustainable…they don’t want it
  - Recycling – plastic to plastic recovery
  - Resource recovery – includes plastics to chemicals which could be a broad range of hydrocarbons; including oil, polymers, waxes, fuel, etc.

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Start at the Start…

- What drives a best practice system for diverting plastics from landfill?
- Quality..of course
  - Give us your plastic BUT only your plastic!...and sort it too please!
- Access to drop off
  - If we build it …will they come?...yes!
- Handling
  - The less people who touch the plastic – the better the system will run

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What Makes a Good System

- Quantity – volume generates efficiency
- maximizing the quantity of materials diverted from landfill will depend on:
  - System design - designing an effective collection system which ensures that the needs of farmers are addressed,
  - Communications - designing and implementing an effective communications campaign by engaging a broad community stakeholder group, and
  - Generating support - gaining the support of farmers to support a sustainable end-of-life for these farm generated plastics.

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Option #1 – Private Waste Collection and Baling

- Private waste management companies set out separate bins at a number of sites in each of the 12 Northern Ontario districts.
  - Sites could be landfill or ag dealer sites (or other!)
  - Contractor collects bins when full or, at end of year, for shipment to a recycling facility where plastic is baled
  - Plastic is then shipped for recovery/recycling to the US or an Ontario destination

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Option #1 – Private Waste Collection and Baling

- What would those numbers look like?
  - 12 districts
  - 4 sites per district (at least! remember the 35 km distance from the survey?)
  - 3 bins per site
- From a cost standpoint…
  - an average $500 per bin delivery charge to the recycler - $72,000 – base line
  - baling – approximately 180 tonnes at $90/tonne baling charge - $16,200 base line
  - already at over $88,000 in processing costs and loose plastic transportation costs

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Option #2 – On-Farm Approach

- Same numbers as before
  - 12 districts
  - 4 sites per district (at least! remember the 35 km distance from the survey?)
- From a cost standpoint…
  - Avoided moving loose plastic around the region
  - Avoided 3rd party custom baling charges
  - already over $88,000 SAVED! in processing costs and loose plastic transportation costs

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Option #2 – On-Farm Approach

- There must be something required to offset the savings?
- Here's how the system works
  - Each of 4 sites per district are provided a basket compactor which is a simple system and can be operated by almost any farm
  - Partners are engaged at the local level – perhaps the municipal landfill or another stakeholder supporting the diversion of plastic from the landfill.
  - Completed bales are collected at local sites during a periodic Collection Event and delivered to a central district location where they get picked up and shipped to the recycler.

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U-Pack System

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Baling Process

Bale to Bale in 5 easy steps!

- Packing the basket
- Compressing the plastic
- Tying off the bale
- Removing the basket
- Moving the bale

U-Pac Recycling Process – Bale Wrap

- U-Pac builds and sells the basket compactors at $500
  - Can be sold to direct to farmers or to a stakeholder group that would stage them at the 4 district sites we mentioned earlier.
  - Compactors are either owned by farmers or available for use at the district sites.
  - Farmers can make their own bales when they have sufficient accumulated, or can work with 5-6 other farms to consolidate their material together to form a bale
- Twice per year, a collection event is held at local sites where bales are delivered for consolidation at a district collection point for pickup by U-Pac.

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Collectable Agricultural Plastic

Estimated Plastic Waste Collection Volume (in tonnes)	LDPE Film	LLDPE Film	PP Twine	PP Net Wrap	PP Woven Bags
Total Estimated Weight	6.2	518.8	122.0	48.5	9.5
Collection rate	25%	25%	25%	25%	25%
Estimated Collectable Weight (tonnes)	1.5	129.7	30.5	12.1	2.4
Average Bale Weight	182 KG	455 KG	455 KG	455 KG	455 KG
Estimated Number of Bales Collectable	9	285	67	27	5
Estimated Loads	8		2	1	

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U-Pac Recycling Process – Twine

- Estimated number of collectable bales of twine in Northern Ontario are 67
- Loads required – 2
- End destination – Recycling in Minnesota
- Turn twine back into PP resin
- Collection model
  - Bales are consolidated at 2 shipping points – NW – Thunder Bay and NE – SS Marie
  - Commercial carriers are used to ship loads to Albert Lea, MN – I-90 Reprocessors
  - Costs for shipping from Thunder Bay and Sault Ste. Marie
  - Revenue for twine recycled

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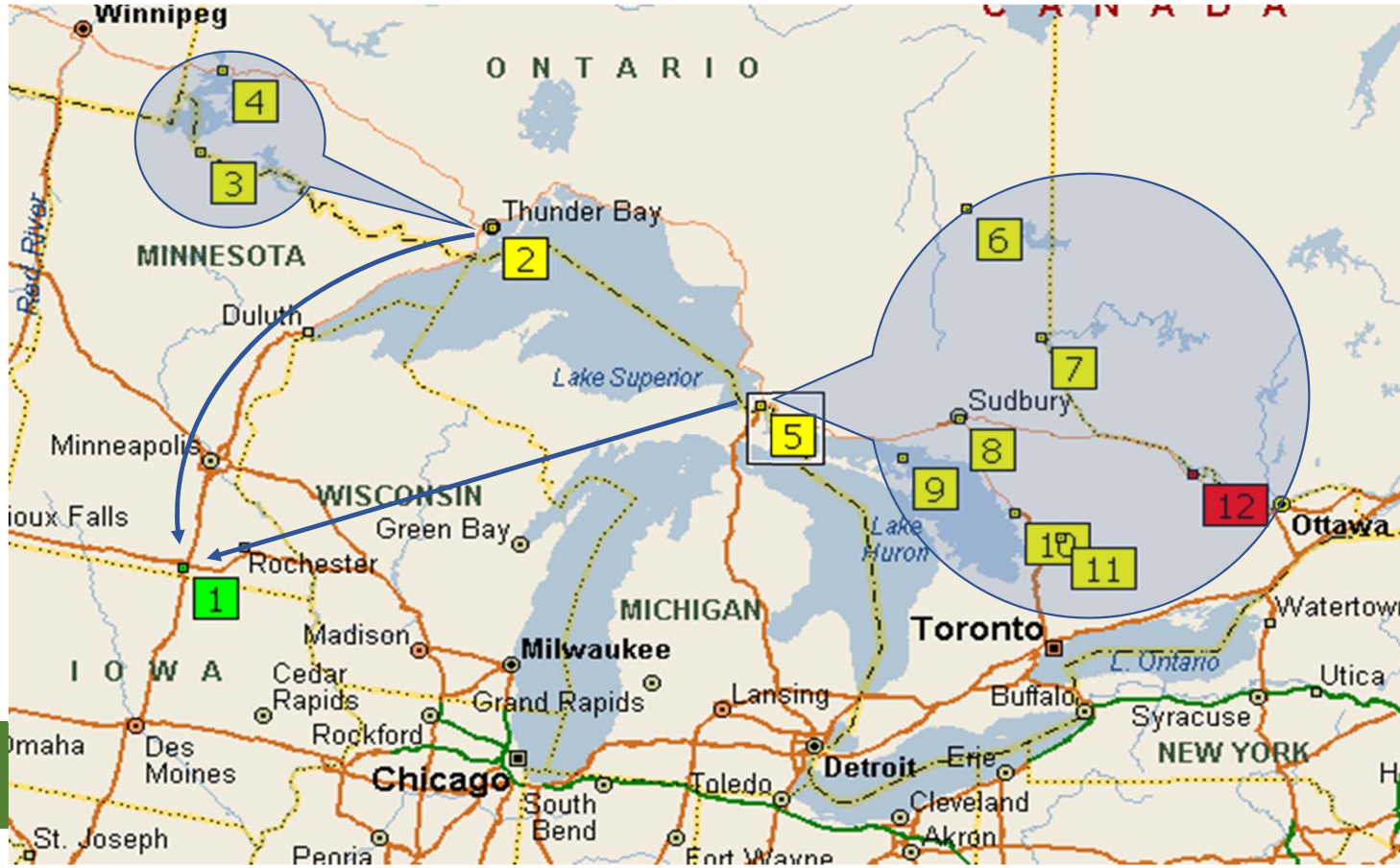
Twine's Journey to Recycling

- Route 1 - $4,385
- Route 2 - $10,443
- Total transportation charges - $14,828



Net Wrap and PP Bags

- Annual delivery of bales at district sites
- Consolidation at Regional staging locations
- LTL pickup and delivery of baled plastic to Emerald EFW for energy recovery.
- Bales are shipped separately from each Regional site, not mixed with other Regional sites – cheaper to go direct than to consolidate all bales together
- Total LTL trucking costs are estimated at $4,876

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End-of-Life Management Disposal Costs Summary

Agricultural Plastic Waste	Disposal Tip Fee or Revenue			Total Estimated Weight Collected (tonnes)	Total Estimated Cost / Revenue
LDPE Film	$0/KG	$ -	/tonne	1.6	$ -
LLDPE Film		$ -	/tonne	129.7	$ -
PP Twine	$0.15/lb US$	$ 410	/tonne	30.5	$ 12,505
PP Net Wrap	$0.14/KG	-$ 140	/tonne	12.1	-$ 1,694
PP Woven Bags				2.4	-$ 336
Net Revenue(Costs)					$ 10,475

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Capital Expenditure Summary

District	Number of Compactors	Unit Cost Per Site Extended (@$500 ea.)	Delivery Extended (@ $250 ea.)	Cost Per Site
Algoma	4	$2,000	$1,000	$3,000
Cochrane	4	$2,000	$1,000	$3,000
Greater Sudbury	4	$2,000	$1,000	$3,000
Kenora	4	$2,000	$1,000	$3,000
Manitoulin	4	$2,000	$1,000	$3,000
Nipissing	4	$2,000	$1,000	$3,000
Rainy River	4	$2,000	$1,000	$3,000
Sudbury	4	$2,000	$1,000	$3,000
Thunder Bay	4	$2,000	$1,000	$3,000
Timiskaming	4	$2,000	$1,000	$3,000
Muskoka	4	$2,000	$1,000	$3,000
Parry Sound	4	$2,000	$1,000	$3,000
Total CAPEX	48	$24,000	$12,000	**$36,000**

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Overhead Cost Estimate

Expense	Amount
Insurance	$4,000
Communications	$5,000
Program Administration	$35,000
Travel	$10,000
Total Overhead Costs	$54,000

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Cost Framework Summary

Financial Item	LDPE and LLDPE Film	PP Net Wrap and Feed Bags	PP Twine	Total
Transportation Costs	N/C	$4,876	$14,828	
Disposal Costs/(Revenue)		$2,030	-$12,505	
Net End-of-Life Cost		$6,906	$2,323	$9,229
Overhead Costs				$54,000
Annual Net Operational Costs				$63,229
Total CAPEX - Program Setup				$36,000
Total Capital Expenditures Required for First Year Setup and Operations				**$99,229**

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What Does the Future Hold?

A Brief Look at the EPR Landscape and How these Changes can Affect Ag Plastic

- June 1, 2016, the Ontario Legislature passed Bill 151, the Waste-Free Ontario Act, 2016 (WFOA)
- a new producer responsibility framework that makes producers individually responsible and accountable for their products and packaging at end of life.
- under this regime, producers become directly accountable for recovering resources and reducing waste as required by regulation.
- “producers” refers to brand owners and first importers of products and packaging, not the generators of waste products and packaging (such as farmers)

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EPR Milestones

The Strategy sets out a series of milestones that the Ministry of the Environment and Climate Change (MOECC) intends to achieve:

2018 – Begin to implement the Food and Organic Waste Action Plan; begin to designate new materials under producer responsibility regulations

2019 – Begin to implement the amended 3Rs regulations to better address industrial, commercial and institutional (IC&I) waste.

2020 – Achieve an interim goal of 30% waste diversion by 2020.

2021 - Begin implementing disposal bans on materials under existing producer responsibility programs.

2023 – Complete transition of the Blue Box Program; and **continue to designate additional materials under the producer responsibility regulations**.

2025 – **Continue to designate additional materials under producer responsibility regulations.**

So Why Should We Care About EPR?

- EPR legislation will affect how you manage your plastic farm waste
- Affects collection site design, locations, responsibilities and obligations
- Affects will be in product costs – expensive program costs get passed down to consumers

So the unique position famers in Ontario are in right now is that they have the opportunity to help design a voluntary system, by engaging all of their stakeholders, BEFORE the government decides how to "require" a system.

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Background and Looking Forward

President of OFA, Keith Currie, made the following general recommendations regarding a producer responsibility framework:

- WFOA and new regulations should expand recycling programs for containers, bags, bale wrap and many other items used on the farm.
- EPR should recognize the barriers of rural, northern, and regional waste diversion costs for collection, to determine the logistics of cost-effective recovery of waste resources, beyond the proposed targets based on community size, density and geographic distribution.
- EPR should recognize that there is no capacity for Agriculture to bear the responsibility for reduction, reuse or recovery of packaging used for the sale of farm production, and that responsibility should lie further along the distribution route. (no free riders! For non-Ontario materials)
- The Strategy needs to assist industry initiatives, such as CleanFARMS, in implementing guidelines and programs, as opposed to imposing regulations.
- Expanding the collection of products for resource recovery and alternate uses should be encouraged and integrated within existing programs. This is a cost-effective approach of increasing services to rural Ontario (e.g. bale wrap collection).

Finally… What to Do Next

- Commit to a diversion program
- Support the program with adherence to guidelines and providing high quality returns of material
- Create a culture and expectation among your peers, that this is the new “normal”
- Take charge of the direction and design of a new program, before the government does it for you.
- Constantly improve

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Envise Consulting Inc. in Partnership with NOFIA

fergal@envise.ca

905-941-2174

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