

Saskatchewan Agricultural Film Plastic Recycling Study

CleanFARMS Inc.
Saskatchewan Ministry of Environment

04.30.10

Prepared by
Blacksheep Strategy Inc.

Table of Contents

1. Project Overview	2
2. Methodology	2
3. Greenhouse Film	3
4. Silage Film.....	4
5. Grain Bags.....	5
6. Plastic Bale Twine and Plastic Net Wrap for Bales	8
7. Mulch Film	10
8. Volume Summary	12
Appendix A (Detailed Calculations)	13

Appendix A is also provided as an Excel spreadsheet.

1. Project Overview

CleanFARMS is a non-profit industry stewardship organization committed to environmental responsibility through the proper management and disposal of agricultural waste. CleanFARMS, supported by a funding grant from the Saskatchewan Ministry of Environment, contracted Blacksheep Strategy to conduct a preliminary assessment of the volumes of certain plastic products used in agriculture in the province of Saskatchewan. The intention is to use this information to assess the feasibility and opportunity for the development of recycling programs for these products.

The primary purpose of this study was to quantify certain types of film plastics used in agriculture in Saskatchewan and identify the manufacturers or importers of these plastics.

- The uses investigated include low density polyethylene (LDPE) #4 plastics used in greenhouse film, silage film and grain bags. Twine and mulch film used in commercial horticulture were also assessed.
- Information on who is producing or importing these materials was also collected wherever possible.
- The study also looks at whether the existing uses for these specific types of plastic products are likely to increase, decrease or stay at existing levels, and whether there are new developments or trends that would impact the use of LDPE in the future.

During the course of the project, numerous companies and individuals were contacted and asked to supply information or data for use in the research. Each request was preceded by a brief explanation of the project and its purpose. In general, interview subjects were positive about the potential for improved stewardship options for these products.

2. Methodology

The study used various methods to estimate the quantity of the specified plastic products used in the province of Saskatchewan.

Literature review – A review of existing studies with similar objectives (but conducted in different geographies) provided some metrics which can be applied to this analysis.

Internet searches – General internet searches provided contact information for domain experts, information on manufacturers and suppliers and some data used to calculate volume estimates.

Domain expert contacts – Where possible, we attempted to utilize the expert advice of specialists in the specific application or use of each type of plastic. For example, the Greenhouse Specialist for the province of Saskatchewan was contacted and asked to estimate the amount of plastic film used for greenhouse covers.

Industry contacts – Major suppliers and manufacturers were contacted by phone or email to obtain their estimates of market size.

Manufacturers and first importers - Major suppliers, retailers and manufacturers were contacted by phone or email to obtain their estimates of market size. In some cases, they also provided information on trends and future developments.

Wherever possible, more than one method and/or source was used in an effort to increase the reliability of the estimate. For example, data such as the amount of feed used in the silage film and twine calculations were sourced both from Saskatchewan Crop Insurance and calculated based on average provincial feeding rates provided by Provincial Livestock Specialists and verified by forage specialists employed by the largest agricultural retailer in the province.

The lists of manufacturers, first importers and retailers included in this report was compiled through internet searches, discussions with those contacted to supply data for this research and from existing documentation.

3. Greenhouse Film

Volume estimates

The Provincial Greenhouse Specialist for Saskatchewan provided an estimate of 239,967 square meters of plastic is used to cover greenhouses in the province. When converted to weight using a factor provided by a major manufacturer of greenhouse film, this represents 33.98 tonnes of total use. Unless it is damaged by extraordinarily severe weather, this plastic film is usually replaced every three years. Therefore the maximum total of this type of film plastic available for recycling annually is estimated to be 11.33 tonnes.

While a major manufacturer of this product declined to specify their assessment of the size of Saskatchewan greenhouse film market, when asked to comment on the number provided by the Provincial Greenhouse Specialist for Saskatchewan, a senior executive with the firm confirmed "that the figure provided is very close."

It should be noted that this estimate does not include agricultural research greenhouses or those used in the silviculture industry. It is safe to assume that given the value of the contents and the importance of consistent environmental conditions in agricultural research greenhouses, the vast majority would be glass rather than plastic. The use of plastic film for silviculture greenhouses was outside of the scope of this project.

One individual surveyed for this product indicated there is significant end-consumer demand for recycling of the plastic trays and liners used by greenhouse operators. These products were outside the scope of this study, but may merit further research.

Trends, future developments and volume drivers

Future developments affecting greenhouse film could include the introduction of new technology which displaces or replaces this form of use. The study did not uncover any significant future trends related to use of greenhouse film.

Key volume drivers for this product include total greenhouse production of crops grown under plastic greenhouses and extraordinary weather or other conditions which could increase the current rate of replacement.

Greenhouse film suppliers

Suppliers of greenhouse film documented during the research are listed below.

The Professional Gardener Co.
Beatty, Saskatchewan
306-752-4150

Westgro Horticultural Supply Inc.
1557 Hastings Crescent S.E.
Calgary, Alberta T2G 4C8
800-661-2991

HJS Wholesale Ltd.
330 Transport Road
Winnipeg, Manitoba R2C 2Z2
204-668-8360

AT Films Inc.
4605-101 Avenue
Edmonton, Alberta T6B 3R4
780-450-7760

4. Silage Film

Volume estimates

An estimated volume of plastic silage film has been calculated based on the total number of cattle in Saskatchewan. The overall number was broken down into beef and dairy cattle as provincial livestock specialists estimate about 90 percent of dairy cattle are fed silage and 10 percent of beef cattle are fed silage. The remainder of each segment is fed a ration based on baled forage or straw.

Average feeding rates provided by a contact at the province's Agriculture Knowledge Centre were then applied to the number of cows to arrive at a volume of feed. Two ratios for the volume of silage film used per tonne of silage were then used to calculate a range for the total silage film used in the province. These ratios were sourced from a previous research paper on agricultural plastics recycling¹. The resulting volumes are 541.96 tonnes and 967.79 tonnes.

These estimates were then reviewed with a major manufacturer of silage film for the Saskatchewan market. The manufacturer declined to provide a specific estimate of the size of this market, but indicated that his company's estimate of the total silage film use in Saskatchewan fell within the range of the two estimates calculated.

¹ Lois C. Levitan, David G. Cox, Martha B. Clarvoe, "Agricultural Plastic Film Recycling: Feasibility and Options in the Central Leatherstocking-Upper Catskill Region of New York State," January 2005, Cornell University, p. 18.

Trends, future developments and volume drivers

Future developments affecting this product could include any introduction of new technology which displaces or replaces this form of use. No emerging technologies were noted during this research.

Key volume drivers for this product include the number of cattle in the province (see twine and net wrap) and more importantly the portion of cattle fed silage versus bales.

One forage specialist we talked to indicated that there may be a slight decline in the number of beef cattle being fed silage in the province but added that there was no hard evidence to support this opinion.

Silage film suppliers

Suppliers of silage film documented during the research are listed below.

AT Films Inc.
4605-101 Avenue
Edmonton, Alberta T6B 3R4
780-450-7760

Dubois Agrinovation
478 Notre-Dame
Saint-Remi, Québec J0L 2L0
or
710 Old Highway 24, R.R. # 3
Waterford, Ontario N0E 1Y0
450-454-3961

Farmer's Sealed Storage
#3, Unit 5 Industrial Park Rd.
South Gower Business Park
Kemptville, Ontario K0G 1J0
613-258-9818

5. Grain Bags

Volume estimates

This category was the most challenging to estimate. Primary quantitative research with farmers could address this to some extent, but was beyond the scope of this project. Based on our inquiries, there appears to be no government or other third party data available to augment data obtained directly from the trade, i.e. those who manufacture and retail these products.

We spoke with a large retailer of grain bags in Saskatchewan. One of the principals indicated that their provincial sales were approximately 9,000 bags per year. Their estimated market share was 50 percent, indicating a total market for the province of 18,000 bags per year. The retailer felt there could be as much as 10 to 15 percent upside to this

number, meaning the total Saskatchewan market could be as large as 20,000 bags per year.

The retailer indicated that last year 3,500 of the bags they sold were imported, with the remaining 5,500 coming from a Canadian manufacturer. This indicates that a significant portion of the market may be supplied by offshore production. The implication is that Canadian manufacturers and wholesalers may be unaware of these imports and as a result, underestimate the size of the total market. A Canadian manufacturer of grain bags provided the lowest estimate of the Saskatchewan market at 8,300 units per year.

We spoke with a smaller wholesaler from Ontario who supplied less than 1,000 bags per year to the Saskatchewan market and he agreed that the total market for Saskatchewan could be as high as 20,000 bags per year. This wholesaler indicated there may now be as many as 10 manufacturers of grain bags globally.

We spoke with two smaller wholesalers in Alberta who supplied grain bags on a wholesale basis to Saskatchewan retailers and supplied direct to Saskatchewan farmers. Both estimated they sold approximately 2,000 bags per year into the province of Saskatchewan. Both thought the estimated market size was less than 20,000 bags per year.

A major wholesaler of bags located in Saskatchewan was interviewed for the study. He estimated the market at 20,000 bags per year and still growing rapidly. He also provided comments on potential future growth and alternative uses for grain bags, which are detailed below.

As grain bags come in a variety of sizes and therefore weights, an estimate of the average weight was used to calculate the volume. An average weight estimate per bag was obtained from a manufacturer, a wholesaler and several retailers. All were close to 300 pounds, the factor used in this study.

The lowest estimate of total market size for this product (8,300 units per year) was used to arrive at a total volume of 1,129.51 tonnes. The lowest and most conservative estimate was chosen as this is a new and emerging product, therefore the market is still developing. This results in less confidence that any one source has an accurate estimate of market size.

Trends, future developments and volume drivers

The use of film plastic for grain bags is the most recent compared to the other products included in this report. Grain bags began to be commonly used for grain storage in the western Canadian market in the last five years. While there has been a rapid increase in grain bag use over the past five years, there are few reliable indicators of the extent of future growth. Due to the variable nature of many aspects of production agriculture, all of the limitations to this product may not be known at this time.

Several of the functional limitations of grain bags are being addressed by new technology. For example early users disliked the clumsy nature of unloading the bags when they wanted to remove the grain. Several companies have now introduced grain bag unloaders which solve this logistics problem. This type of innovation suggests that the product is here to stay and the market will likely continue to grow.

Some of the use of grain bags is replacing the common practice of storing lower value crops, usually cereals, on the ground when conventional grain storage bins were

unavailable. Many farmers have enough bin storage for an average crop, but run short of grain storage when weather and other production variables produce a larger than average crop. Grain bags are seen as a cost effective option in this situation.

Concerning potential adoption and growth, one of the wholesalers contacted for this study stated that in Argentina, where use of grain bags is more prevalent than in Canada, one company with 40% market share expects to sell 287,000 bags this year. This information would seem to indicate the potential for this market to grow considerably if the use of this storage method continues to prove to be an effective and efficient storage option.

This same wholesaler also noted a significant non-agricultural use for grain bags which is just beginning to emerge in Saskatchewan and Alberta. Oil companies require environmentally secure storage for large amounts of silica sand used in a process called fracking. They are beginning to experiment with grain bags and heavier 12 mil bags. Sand has for this use has traditionally been stored in covered bunkers. This emerging use could be a significant source of used bags for recycling if this practice becomes widespread.

The key volume drivers for grain bags include increasing crop volumes produced in Saskatchewan and the turnover of farm land from established farmers with bin storage to larger farmers who do not have traditional bin storage and chose to utilize more economical storage options rather than invest in bins. Grain bag usage could also increase if the portion of farmers renting land increases.

One driver often cited was the efficiency of storing grain in the field where it was harvested rather than the traditional practice of hauling much of it to centrally located bin storage. Major factors are reduced fuel cost and a lower requirement for trucks and the labour to operate them.

Grain bag suppliers

Suppliers of grain bags documented during the research are listed below.

PowerFill

Home Office:

5015-45 Ave
RR#1, SITE 19, Box 2
Millet, Alberta
T0C 1Z0
780-387-3600

Saskatchewan Office:

Marsden, Saskatchewan
306-823-3432

Canadian Hay and Silage Limited

R.R.1

Bowden, Alberta T0M 0K0

403-224-2072

Grain Bags Canada

Lake Lenore, Saskatchewan S9K 2J0

306-682-5888

AT Films Inc.
4605-101 Avenue
Edmonton, Alberta T6B 3R4
780-450-7760

Amity Ag
780-348-5355

Gem Silage Products
403-342-7522

An un-named company in Argentina

6. Plastic Bale Twine and Plastic Net Wrap for Bales

Volume estimates

An estimated volume of plastic bale twine and net wrap has been calculated based on the total number of cattle in Saskatchewan. The overall number was broken down into beef and dairy cattle as provincial livestock specialists estimate about 10 percent of dairy cattle are fed silage and 90 percent of beef cattle are fed silage. The remainder of each segment is fed a ration based on silage.

Average feeding rates provided by our contact at the province's Agriculture Knowledge Centre were then applied to the number of cows to arrive at a volume of feed. Several ratios for the volume of silage film used per tonne of forage and straw were then used to calculate a range for the total plastic twine and net wrap used in the province.

The owner of a large custom baling and harvesting company based in Saskatchewan was interviewed to determine rates of use for twine and net wrap. These use rates were then converted to weight of plastic per tonne of forage or straw, using specifications supplied by a twine and net wrap retailer. This produced an estimated volume of 1,325.15 tonnes.

A second factor was obtained from a leading twine retailer with multiple retail outlets located across Saskatchewan. This factor was applied to the total tonnes of forage and straw for a second estimate of total volume of 1,067.48 tonnes of twine.

The custom baler confirmed that the same amount of net wrap or twine is used whether the farmer is baling forage or straw. Confirmed by other sources, this rules out a significant variation of plastic volume between the two products being processed and enhances our confidence in any estimate based on total tonnes of material baled in the province.

Several sources were contacted to estimate the percentage of twine use vs. net wrap use. Estimates ranged from a low of 10 percent to a high of 30 percent of farmers using net wrap instead of twine. Because of the slightly higher cost of net wrap vs. twine and the fact that a special attachment for the baler is required, farmers with who bale larger volumes and have newer balers are more likely to use net wrap. While relatively few farmers have a net wrap attachment on their baler, those that do have one tend to be larger farmers who account for more of the total tonnes of forage and straw baled in the province. The lowest estimate of 10 percent was used in calculating total net wrap volume due to the lack of

reliable data indicating use rates are actually higher. This resulted in an estimate of 208.59 tonnes of net wrap.

Trends, future developments and volume drivers

As with other products included in the research, the development of new or improved technology such as an effective and efficient biodegradable plastic twine would have an impact on this segment.

Introduced to the market approximately 20 years ago with broad adoption beginning 10 years ago, net wrap has gained a significant share of the baling market. Some estimates from custom balers range as high as 33% of all forage and straw bales are now secured with net wrap as opposed to plastic twine. The shift from twine to net wrap will increase total volumes of plastic from this source, as net wrap uses more weight per tonne of baled forage or straw.

A second important trend influencing volumes of twine and net wrap is total provincial cattle numbers. The number of cattle in Saskatchewan reported by Statistics Canada dropped 15% from January 2009 to January 2010. Other reports from Statistics Canada indicate a long term trend of a declining national bovine herd over the last 15 years: *January 1, 2010 press release, "As of January 1, 2010, farm inventories of cattle reached their lowest level in 15 years ..."*

As cattle numbers are the key driver for the use of this type of plastic, this trend is an important one and needs to be considered in all long term planning and projections for sourcing plastic twine for recycling purposes.

Use of twine in other livestock sectors such as bison or horses was not measured in this study. The number of bison and the number of horses on farms already exceed the number of dairy cattle in the province. Horse ownership by non-farm residents is not measured by Statistics Canada, but is believed to be significant. These growing segments may somewhat offset the reduced twine volumes related to declining cattle numbers in the province.

Plastic twine and net wrap suppliers

Suppliers of plastic twine and net wrap documented during the research are listed below.

PowerFill

Home Office:

5015-45 Ave
RR#1, SITE 19, Box 2
Millet, Alberta
T0C 1Z0
780-387-3600

Saskatchewan Office:

Gary Graham
Marsden, Saskatchewan
306-823-3432

Canadian Hay and Silage Limited
R.R.1
Bowden, Alberta T0M 0K0
403-224-2072

Donaghy's
Nobleford, Alberta
403-795-7062

Bridon Cordage Ltd.
Saskatoon, Saskatchewan
306-652-4133

Amjay Ropes & Twines Ltd.
Newmarket, Ontario
905-830-6755

Federated Cooperatives
401 22nd St E
Saskatoon, Saskatchewan S7K 0H2
306-244-3311

Peavey Mart
7740 - 40 Ave
Red Deer, Alberta T4P 2H9
403-346-8991

Syfilco Ltd.
320 Thames Rd. E.
Exeter, Ontario N0M 1S3
519-235-1244

Tama Canada Ltd.
50 Dundas Street East - Suite 200,
Dundas, Ontario L9H 7K6
905-690-4442

7. Mulch Film

Volume estimates

The Provincial Specialist, Fruit Crops for Saskatchewan provided an estimate of for the amount of plastic mulch used on fruit crops in the province. The majority of this product is used on strawberries, fruit trees and bush berries. The estimated total use is 609,000 square meters however because these crop types are perennial, annual use rates would be one quarter of this or 152,000 square meters.

The Provincial Specialist, Vegetable Crops for Saskatchewan provided an estimate of for the amount of plastic mulch used on vegetable crops in the province. The primary uses are in pumpkin and melon production. These two crops make up approximately 100 acres

annually. Nearly all of the acres utilize mulch at a cover rate of 30% of the production area. The calculated volume for this use is 190,000 square meters.

When volumes for fruit crops are added to volumes used in vegetable crops, the total annual volume of plastic mulch for these two sectors is estimated at 7.56 tonnes.

Trends, future developments and volume drivers

Future developments impacting the volume of this type of film available for recycling include improvement of biodegradable mulch products available today. The current biodegradable mulch products are reported to decay prematurely. As a result, use is limited. If this problem is solved, it is conceivable that biodegradable mulch could take over the market meaning this source of plastic film is no longer available.

A second factor might be any other improvements to the product which would enhance the agronomic value and therefore increase the use rate.

No trends were noted for this product during the research project. The key volume driver for this product is the total production of fruit and vegetable crops grown under plastic mulch.

Mulch film suppliers

Suppliers of mulch film documented during the research are listed below.

Dubois Agrinovation
478 Notre-Dame
Saint-Remi, Québec J0L 2L0
or
710 Old Highway 24, R.R. # 3
Waterford, Ontario N0E 1Y0
450-454-3961

Robert Marvel Plastic Mulch
2425 Horseshoe Pike (Rt. 322)
Annville, PA 17003
717-838-0976

Westgro Horticultural Supply Inc.
1557 Hastings Crescent S.E.
Calgary, Alberta T2G 4C8
800-661-2991

The Professional Gardener Co. Ltd.
915-23 Ave S.E.
Calgary, Alberta T2G 1P1
403-263-4200

Mechanical Transplanter Co.
1150 Central Ave.
Holland, MI 49423
616-396-8738

Plastitech Inc.
478 Notre-Dame, C.P. 750
St-Remi, Quebec J0L 2L0
800-667-6279

Pliant Corp.
1515 Woodfield Rd. Suite 600
Schaumburg, IL 60173
866-878-6188

Rochelle Plastic Film
P.O. Box 606
Rochelle, IL 61068
815-562-7848

Climagro Mulch Film
LECO Industries
3235 Sartelon
St-Laurent, Quebec H4R 1E9
800-561-8029

Ken-Bar Inc.
25 Walkers Brook Drive
Reading, MA 01867-0704
781-944-0003

8. Volume Summary

Product	Estimated Volume
Greenhouse Film	11.33 tonnes
Silage Film	541.96 to 967.79 tonnes
Grain Bags	1,129.51 tonnes
Plastic Twine	1,067.48 to 1,325.15 tonnes
Net Wrap	208.59 tonnes
Mulch Film	7.56 tonnes
Total	2,966.43 – 3,649.93 tonnes

While the values above are estimates, every reasonable effort has been made to ensure that they are as close to actual use rates as possible. Where assumptions were required, the authors of this study have attempted to err on the side of caution and use the most conservative values available.

The estimated range of error for most of the products should be in the range or 10 to 20%. As noted in the report, estimates of grain bag use in the province varied considerably and the reliability of this estimate may be lower than for other products. As noted previously, the lowest estimate of market size was used to ensure the volume of this product has not been overestimated.

Appendix A: Saskatchewan Agricultural Film Plastic Recycling Study Calculations (the actual spreadsheet has also been provided to CleanFARMS)			Notes
Mulch calculations			
Fruit tree and berry bush (linear feet)		1,200,000.00	
Strawberries (linear feet)		1,440,000.00	
Total square metres for fruit		981,412.64	Linear feet x 4 foot wide mulch strip / 10.76 sq ft/sq metre.
Weighting factor (75%)		736,059.48	The specialist providing this estimate indicated all growers do not use plastic mulch.
Annual use (sq meter) based on 4 yr life		184,014.87	Mulch has a four year life span, therefore annual use is 25% of total use.
Vegetables: 100 acres @ 30% cover (sq ft)		1,306,800.00	
Converted to sq metres		121,405.64	
Weighting for re-use and biodegradable (90%)		109,265.08	A small portion of mulch is biodegradable or reused, therefore not available for recycling.
Total mulch use sq ft		3,156,840.43	
Weight for 1.1mil; 4000 ft roll = 84.5lb or .00528 lb/sq ft		16,668.12	This factor supplied by a major manufacturer.
Converted to tonnes		7.56	

Twine and Net Wrap Calculation	Total	Weighting Factor	Value for Calculation	
Number of Beef Cattle Statistics Canada; January 2010.	2,755,000.00	0.90	2,479,500.00	A Saskatchewan livestock specialist provided the weighing factors by bovine type. Remaining % are fed silage.
Number of Dairy Cattle; Statistics Canada; January 2010.	45,000.00	0.10	4,500.00	A Saskatchewan livestock specialist provided the weighing factors by bovine type. Remaining % are fed silage.
Average annual hay and straw volume (tonnes)			3.63	
Total hay and straw (tonnes)			9,016,333.94	Saskatchewan Crop Insurance data was used to ensure the accuracy of this value.
Adjusted for net wrap use			8,114,700.54	Net wrap is used in place of twine on 10% of all baled forage and straw.
Twine per tonne of forage and straw (kg) retailer estimate			0.13	
Twine per tonne of forage and straw (kg) custom baler estimate			0.16	
Twine (tonnes) using retailer estimate			1,067.48	
Twine (tonnes) using custom baler estimate			1,325.15	
Net Wrap (tonnes) using custom baler estimate			208.59	Net wrap used at a rate of .51lb per tonne on 10% of baled forage and straw.
Greenhouse Film Calculation				
Estimate by prov. specialist and confirmed by major manufacturer (sq. meters)			239,967.00	
Converted to sq ft			2,582,984.40	
Conversion factor from manufacturer 1000sq.ft. = 29lb			74,906.55	
Converted to tonnes; total use			33.98	Greenhouse film is replaced every three years on average. Total divided by 3 equals annual use.
Converted to tonnes; annual use			11.33	

Grain Bags Calculation				
Retailer estimate (bags per year)			18,000.00	
Retailer estimate (bags per year)			10,000.00	
Wholesaler estimate (bags per year)			8,300.00	
Wholesaler estimate (bags per year)			20,000.00	
Estimate used to calculate total volume (bags per year)			8,300.00	Average weight per bag, various sources, 300lb per bag.
Converted to tonnes			1,129.51	Highest estimate of 20,000 bags = 2,721 tonnes.
Silage cover calculation				
	Total	Weighting Factor	Value for Calculation	
Number of Beef Cattle; Statistics Canada; January 2010.	2,755,000.00	0.10	275,500.00	
Number of Dairy Cattle; Statistics Canada; January 2010.	45,000.00	0.90	40,500.00	
Total number of cattle, adjusted for upright silos.			284,400.00	Silage stored in upright silos does not require cover. 10% of cattle are fed from an upright silo. This estimate from a prov. livestock specialist.
Using Levitan's 4.2 lb per cow factor (tonnes)			541.96	
Using Levitan's 7.5 lb per cow factor (tonnes)			967.79	