

Agricultural Plastics Recycling Agricultural Producers Survey

Final Report

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KEY TAKEAWAYS

1. The majority (56%) of farms in Alberta use one or more types of agricultural plastics. Usage is relatively equal amongst most regions – South (60%), Central (59%), Northeast (58%) and Northwest (52%) – but significantly lower in the Peace region (44%).
2. A best estimate of the total amounts of agricultural plastics eligible for recycling in the past 12 months would be in the ballpark of 3,000 metric tonnes. The amounts (by weight) of plastic grain bags or tubes, baling twine and silage pit or pile covers are roughly equal: 969 tonnes, 857 tonnes and 1,066 tonnes, respectively. One should keep in mind that agricultural plastics usage can vary dramatically from year to year, thus data based on a one year timeframe should be interpreted with caution.
3. Seven-in-ten Alberta farmers expect their usage of agricultural plastics to remain the same over the next three years, while just one-in-ten anticipate an increase.
4. Baling twine is by far the most commonly used type of agricultural plastic among all agricultural plastics users (i.e. crops, livestock or mixed); 90% reported using plastic baling twine in the past 12 months.
5. Burning is a common practice for managing agricultural plastic at end-of-life, while sending plastics to a landfill site is also a frequently used practice. From the Municipal Waste Authority survey, we know a relatively small percentage of plastic is diverted for recycling as among the 71% of authorities that accept plastic, 84% say they have buried one or more types of agricultural plastics in their landfill while 33% say they have shipped any type of plastic to a recycler.
6. Incidence of recycling agricultural plastics among producers is low. Overall, 17% of agricultural plastics users sent one or more types of plastics for recycling in the past 12 months.
7. There is strong consensus among agricultural plastics users that it is important to be able to recycle their agricultural plastics. A clear majority, however, feel it is difficult to do so and are dissatisfied with their current access to agricultural plastics recycling.
8. The most frequent difficulty identified with regards to recycling agricultural plastics is by far “no recyclers nearby” (43%). For producers who had not recycled or tried to recycle agricultural plastics in the past, just under half (46%) said “more recycling or collection facilities” would encourage them to do so. Increasing convenience and/or ease of recycling is also important.
9. Various environmentally-related motivators emerge as the key reasons for recycling or trying to recycle agricultural plastics. These include, among others, “to re-use or recycle” (19%), “environmental concerns” (16%), “plastics do not degrade easily” (6%) and “air pollution” (5%).

BACKGROUND AND METHODOLOGY

Background and Objectives

Agricultural plastic use, particularly grain storage bags, is increasing and concern over managing it as waste is rising in Alberta. Indeed, a recent survey conducted by Ipsos found that within the livestock sector, less than half of Alberta agricultural producers recycled plastics such as baler twine, feed bags, silage wraps and/or bale wraps. As some stakeholders have looked to the Government of Alberta (GoA) for leadership, Alberta Environment and Sustainable Resource Development (ESRD) and Alberta Agriculture and Rural Development (ARD) wished to further scope the issue.

Specifically, ESRD and ARD wanted to conduct two surveys – one with Alberta agricultural producers and another with waste management authorities – to collect statistically significant, Alberta-specific data to inform potentially policy options on the issue for both Ministers' consideration.

For the purposes of the surveys, agricultural plastics were defined as plastic baling twine, plastic bale wrap, plastic bale tubes, plastic bale bags, plastic silage bags or tubes, plastic silage pit or pile covers and plastic grain bags or tubes. Other plastics were out-of-scope. While net wrap was out-of-scope as it a non-recyclable product, ESRD and ARD wished to identify the percentage of agricultural producers in Alberta using the product – thus, usage of net wrap was asked in the screening questions. Producers were read a definition of each type of plastic assessed and were therefore aware of how net wrap differs from bale or silage wrap.

Primary objectives of the surveys were to identify:

- The types and amounts of agricultural plastics used in Alberta (including trends to see if usage is going up over time);
- Current end-of-life management practices;
- Willingness and challenges associated with handling and recycling agricultural plastics;
- The level of awareness and activity related to recycling agricultural plastics; and,
- Characteristics of producers who use agricultural plastics (e.g. age, type of operation, gross farm sales, census area, etc.).

This report presents findings from the Agricultural Producers survey. Findings for the survey with Municipal Waste Authorities are provided under a separate cover.

One should note that the timeframe for reporting usage and management practices was the 'past 12 months' as it was considered a more relevant frame of reference for producers than a calendar year.

Methodology

Ipsos Reid conducted a telephone survey with a random and representative sample of 660 Alberta agricultural producers between June 11th and July 12th, 2012. This yielded a sample of 375 agricultural plastics users and 285 non-users. The average interview length was 13 minutes for agricultural plastics users and 4 minutes for non-users.

The target population for this survey was primary agricultural operators in Alberta who had gross farm sales of at least \$10,000 in 2011, and had a key role in operating their farm. The sample was drawn from Ipsos' proprietary provincially representative database of over 30,000 unique Alberta agricultural producers. In addition to a target sample of 375 agricultural plastics users, targets were also set for operation type, with a minimum of 100 respondents each from operations that are primarily crops, primarily livestock and mixed. The final sample size for each was 105, 155 and 102, respectively.

The sample was stratified by five Alberta regions based on 2011 Census Regions and Divisions. A disproportionate sampling plan was used in order to allow for a reliable sample size within each region for analysis. Target quotas by CD (within each region) were proportionate to 2011 Census of Agriculture data. In addition to regional quotas, target quotas were also established for gross farm sales within each of the five regions based on 2011 Census of Agriculture data. While no hard quotas were set, targets were monitored throughout data collection.

The final data were weighted to ensure the overall sample's regional and gross farm sales composition reflects that of the actual distribution of farms with \$10,000 or more in gross farm sales in Alberta based on the 2011 Census of Agriculture.

With a sample of 660, results are considered accurate to within ± 3.9 percentage points, 19 times out of 20, of what they would have been had the entire population of Alberta farms been surveyed. The margin of error for the sample of 375 agricultural plastics users is ± 5.1 percentage points, while the margin of error for 285 non-users of agricultural plastics is ± 5.8 percentage points. The margin of error is larger within regions, by operation type and for other sub-groupings of the survey population.

The tables below summarize the number of interviews conducted by region.

Sample Stratification

Region	Number of Interviews
South	127
CD 1	36
CD 2	69
CD 3	22
Central	137
CD 4	11
CD 5	23
CD 6	34
CD 7	24
CD 8	36
CD 9	9
CD 15	0

Region	Number of Interviews
North East	133
CD 10	96
CD 12	37
North West	145
CD 11	82
CD 13	59
CD 14	4
Peace	118
CD 17	55
CD 18	9
CD 19	54

Data Analysis

Survey results are presented for the overall weighted sample of Alberta farms with \$10,000 or more in gross farm sales. Where possible, significant differences – both for agricultural plastics users versus non-users, and by farm and agricultural operator characteristics (e.g. region, gross farm sales) – are highlighted throughout the report.

We refer to “significantly” different results when statistically meaningful differences occur. In simple terms, statistical significance means that two (or more) numbers are different from one another for reasons other than by chance. In statistical terms, it means that a null hypothesis is rejected and that the same result will occur, given similar circumstances, within a set of specified limits (19 times out of 20). Significance tests allow researchers to say, with a specified degree of certainty, that two numbers are different.

The simplest measure of significance is the confidence level given to a percentage in the survey. Most surveys contain a qualifying statement, such as, “*the results of this survey have a margin of error of ±5.1 percentage points, 19 times out of 20.*” This number reflects the window or spread of values expected across different survey samples. As well, we used propmean t-tests, which are t-tests run on column means and column proportions.

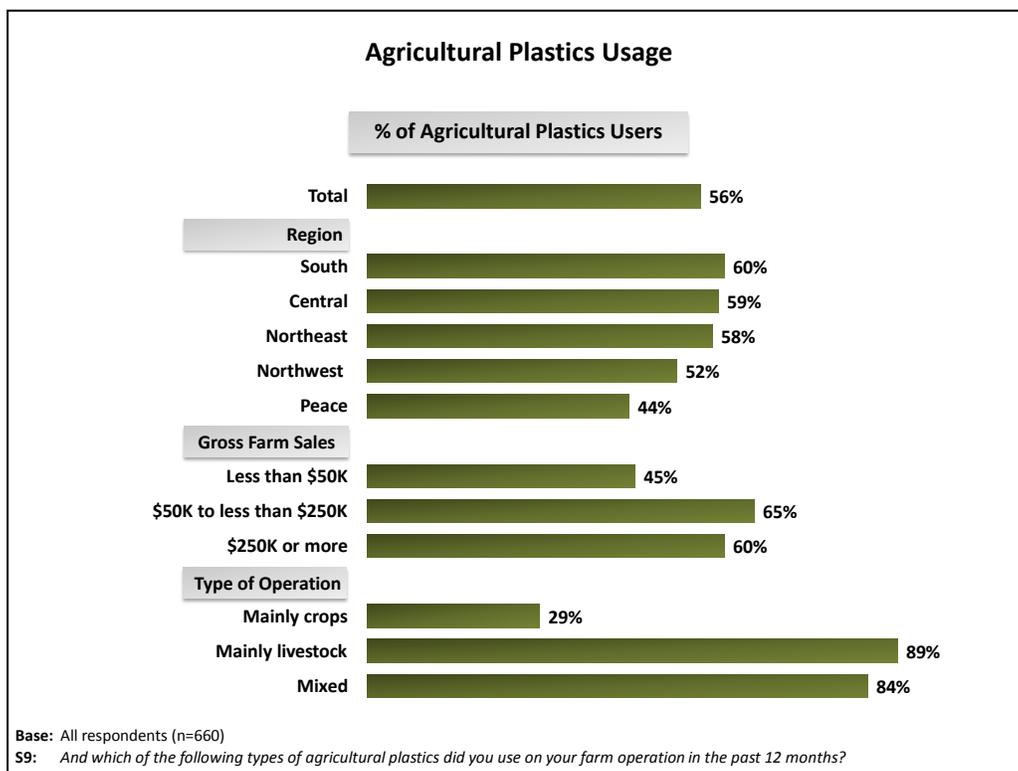
TYPES AND AMOUNTS OF AGRICULTURAL PLASTICS USED

Agricultural Plastics Usage

The majority (56%) of farms in Alberta use one or more types of agricultural plastics.

Usage of agricultural plastics is significantly *lower*:

- In the Peace region (44%) compared to the South (60%), Central (59%) and Northeast (58%) regions of Alberta;
- On operations with gross farm sales of less than \$50K (45%) versus those with gross farms sales of \$50K to less than \$250K and \$250K (65%) or more (60%); and,
- On operations with crops as their main source of revenue (29%) compared to those that derive their revenue mainly from livestock (89%) or an equal mix of crops and livestock (84%).

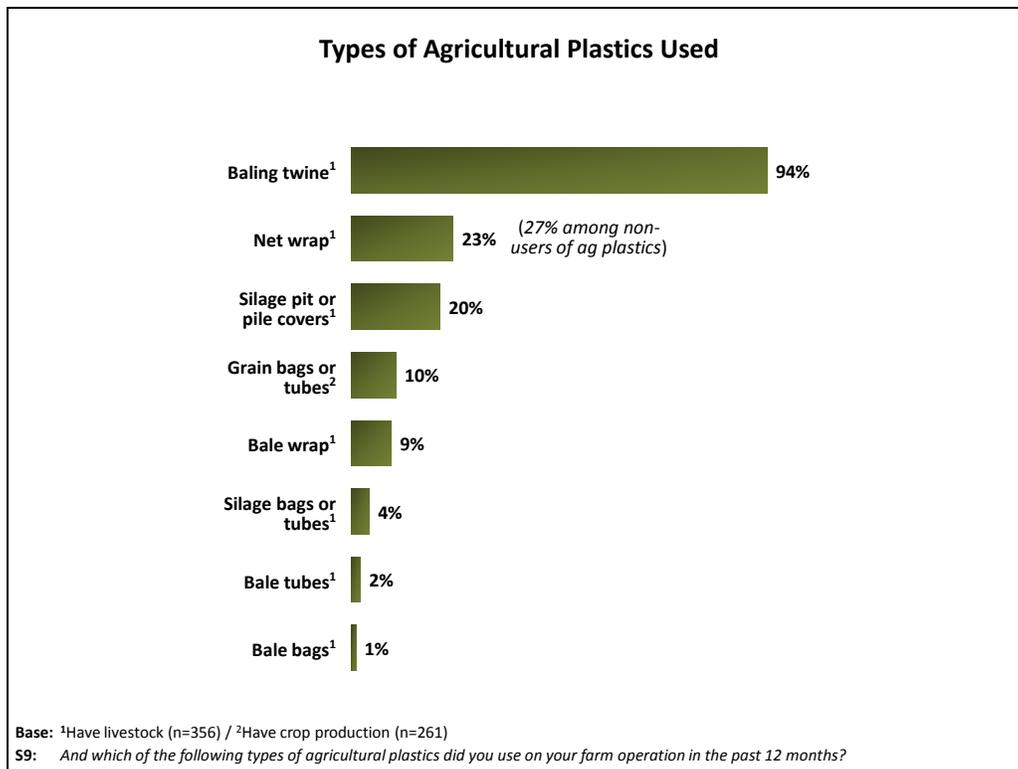


Usage of agricultural plastics is significantly *higher* on operations that are **expanding** (69%) compared to those in the beginning or maintaining (54%) and reducing (54%) stages.

Types of Agricultural Plastics Used

Among agricultural plastics users, baling twine is by far the most commonly used type of agricultural plastic.

- Among operations with livestock that use one or more types of in-scope agricultural plastics, 94% report using baling twine in the past 12 months. Roughly one-in-five say they have used net wrap (23%) or silage pit or pile covers (20%), while reported use of all other plastics falls below the ten percent mark – 9% for bale wrap, 4% for silage bags or tubes, 2% for bale tubes and 1% for bale bags.
- Among operations that have crop production, one-in-ten (10%) report using grain bags or tubes in the past 12 months.

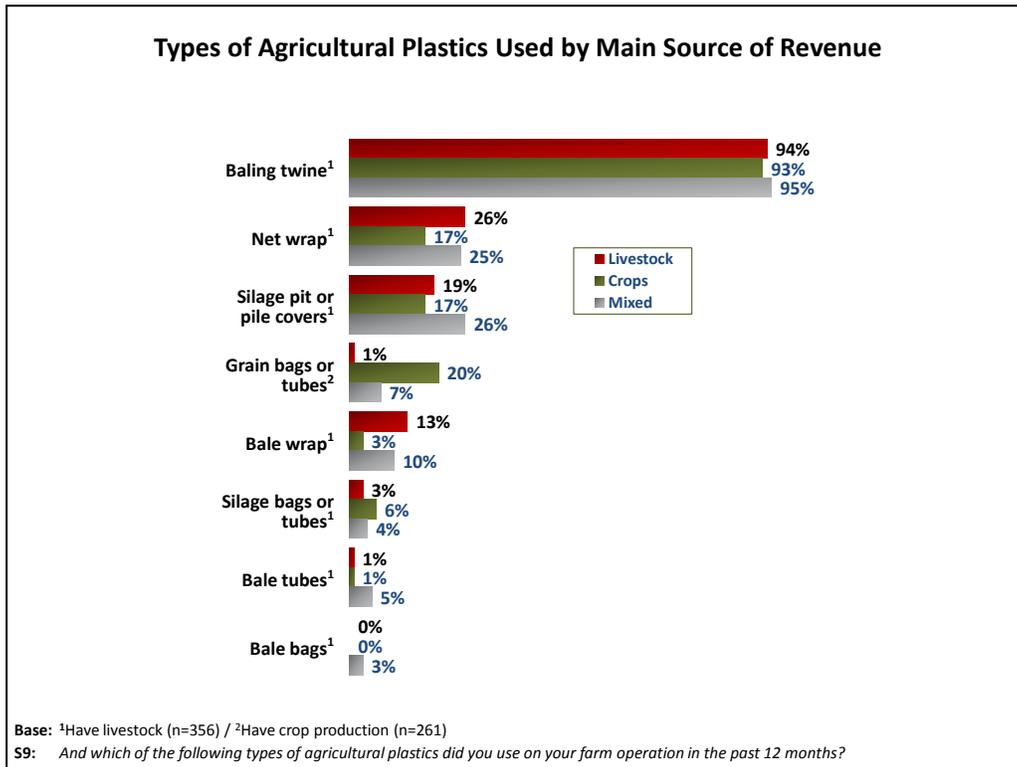


It is notable, that regionally, usage of grain bags or tubes is highest in the Peace region (11%).

Types of Agricultural Plastics Used by Main Source of Revenue

Looking at agricultural plastics usage by main source of revenue, only two significant differences emerge:

- Use of grain bags or tubes is significantly *higher* on operations that are primarily crops (20%) compared to those that are mixed (7%) or primarily livestock (1%).
- Conversely, use of bale wrap is significantly *higher* on operations that are primarily livestock (13% vs. 3% primarily crops).



Total Weight of Agricultural Plastics Used

The mean weight and total weight of each type of plastic used by agricultural plastics users was calculated. Users of each type of agricultural plastic were asked a number of questions that fed into the total weight calculation for each specific plastic – only data from those that gave valid responses to *all* such questions could be used in the calculations, in some cases, decreasing the sample size significantly. The formulas used to calculate total weights are provided in Appendix A.

Considering the sample size for each weight calculation, estimates for plastic baling twine (n=279) and silage pit or pile covers (n=51) are the only ones that should be considered accurate. An estimate is also provided for plastic grain bags, however, one should note that it is based on only 19 respondents.

Further, it is important to bear in mind that usage is based on a one year timeframe – the amounts of agricultural plastics used can vary dramatically from year to year. Thus, data based on usage in ‘the past 12 months’ should be interpreted cautiously.

Baling Twine

It was of interest to calculate both the total weight of baling twine used as well as the total weight of baling twine used that was eligible for recycling – that is, the amount of twine *not* shredded (if baling twine is shredded, it is not available for recycling).

Among all agricultural plastics users (i.e. crops, livestock or mixed), 90% reported using plastic baling twine in the past 12 months and fed or used one or more bales, while 69% did so and removed the twine (i.e. did not mechanically shred it).

The mean weight of baling twine for bales fed or used and either removed or shredded was 70kg while the total weight of baling twine used in the past 12 months on Alberta farms with \$10K or more in gross farm sales was 1,253,392 kg (1,253 tonnes).

Baling Twine: Total Used	Removed or Shredded (n=279)
<25 kg	37%
25 to 49 kg	20%
50 to 99 kg	26%
100 to 199 kg	13%
200 to 1,999 kg	5%
Mean	70kg
Total Weight	1,253,392 kg

Baling Twine: Eligible for Recycling	Removed (n=196)
<25 kg	37%
25 to 49 kg	19%
50 to 99 kg	30%
100 to 199 kg	10%
200 to 1,999 kg	4%
Mean	64.2kg
Total Weight	856,599 kg

Considering twine that would be eligible for recycling (i.e. was not shredded), the mean weight of twine was 64.2kg while the total weight of twine used in the past 12 months on Alberta farms with \$10K or more in gross farm sales was 856,599 kg (857 tonnes).

Silage Pit or Pile Covers

Among all agricultural plastics users (i.e. crops, livestock or mixed), 18% reported using and emptying one or more silage pit or pile covers in the past 12 months.

The mean weight of silage pit or pile covers used and emptied was 297.6 kg, while the total weight of silage pit covers used in the past 12 months on Alberta farms with \$10K or more in gross farm sales was 1,065,706 kg (1,066 tonnes) of plastic silage pit or pile covers emptied

Silage Covers	(n=51)
1 to 99 kg	22%
100 to 199 kg	27%
200 to 299 kg	14%
300 to 399 kg	14%
400 to 499 kg	14%
500 to 2,099 kg	10%
Mean	297.6 kg
Total Weight	1,065,706 kg

Grain Bags or Tubes

Among all agricultural plastics users (i.e. crops, livestock or mixed), 6% reported using and emptying one or more grain bags or tubes in the past 12 months.

The mean weight of grain bags or tubes used and emptied was 811.7 kg and the total weight of grain bags or tubes used in the past 12 months on Alberta farms with \$10K or more in gross farm sales was 969,170 kg (969 tonnes).

Grain Bags/Tubes	(n=19)
1 to 99 kg	14%
100 to 199 kg	5%
200 to 499 kg	26%
500 to 999 kg	32%
1,000 to 1,999 kg	24%
Mean	811.7 kg
Total Weight	969,170 kg

Again, one should note, that the sample size for this calculation is very small (i.e. based on 19 respondents). Overall, 33 respondents indicated they used and emptied plastic grain bags or tubes in the past 12 months. Among these, 1 respondent was unable to specify the *length* of the most commonly used grain bags or tubes, while 13 respondents did not know the *thickness* of the most commonly used grain bags or tubes. Thus, the calculation is based on the 19 respondents who were able to answer both questions.

Other Types of Agricultural Plastics

Similar formulas were used to calculate the weight of other types of agricultural plastics. While the tables that follow summarize the total weight of each used by each respondent, this data should be *used and interpreted with extreme caution as the sample sizes are very small* and likely not representative of the broader population of farms in Alberta.

Among all agricultural plastics users (i.e. crops, livestock or mixed), 4% reported using plastic bale wrap in the past 12 months and fed one or more bales, 2% reported using and emptying one or more silage bags or tubes and 1% reported using and emptying one or more bale tubes.

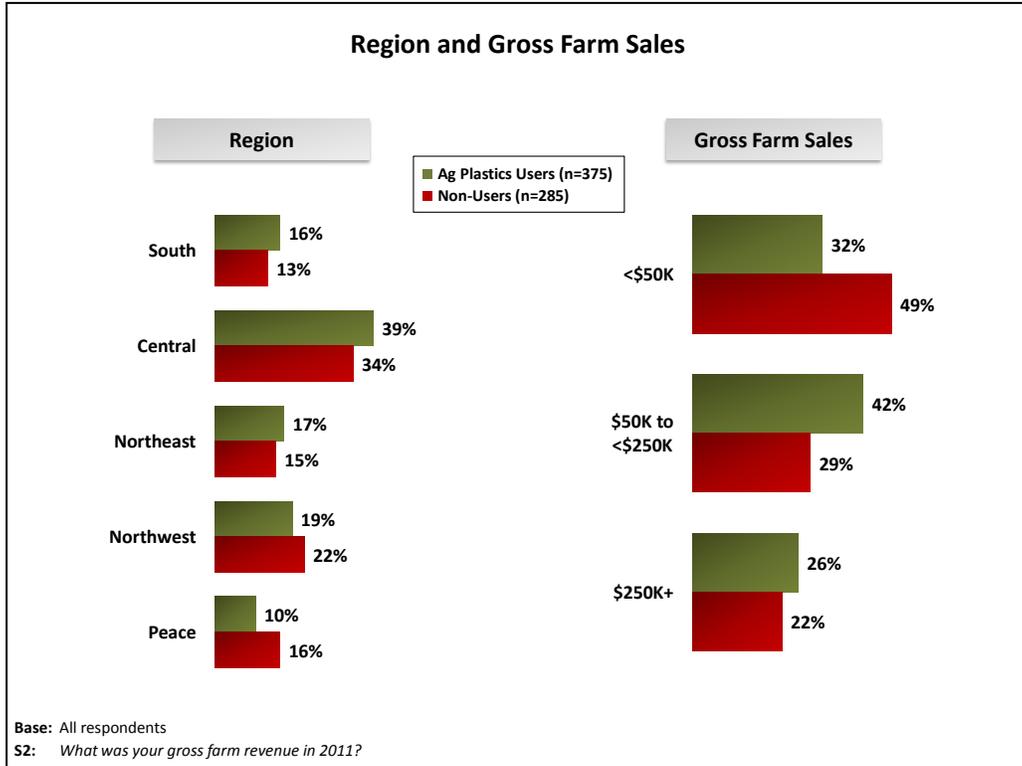
Bale Wrap	n=4	Silage Bags/Tubes	n=4	Bale Tubes	n=3
100 to 199 kg	n=1	100 to 199 kg	n=1	<1 kg	n=1
500 to 999 kg	n=1	200 to 499 kg	n=1	2,000 to 4,999 kg	n=1
2,000 to 4,999 kg	n=2	500 to 999 kg	n=1	5,000 to 5,999 kg	n=1
Total Weight		1,000 to 1,999 kg	n=1	Total Weight	
8,320.7 kg (8.3 tonnes)		Total Weight		8,587.4 kg (8.6 tonnes)	
		1,927.2 kg (1.9 tonnes)			

FARM AND AGRICULTURAL PRODUCER CHARACTERISTICS: AGRICULTURAL PLASTICS USERS VERSUS NON-USERS

There are no significant differences between agricultural plastics users and non-users by region or past two years participation in environmental training. There are, however, significant differences by:

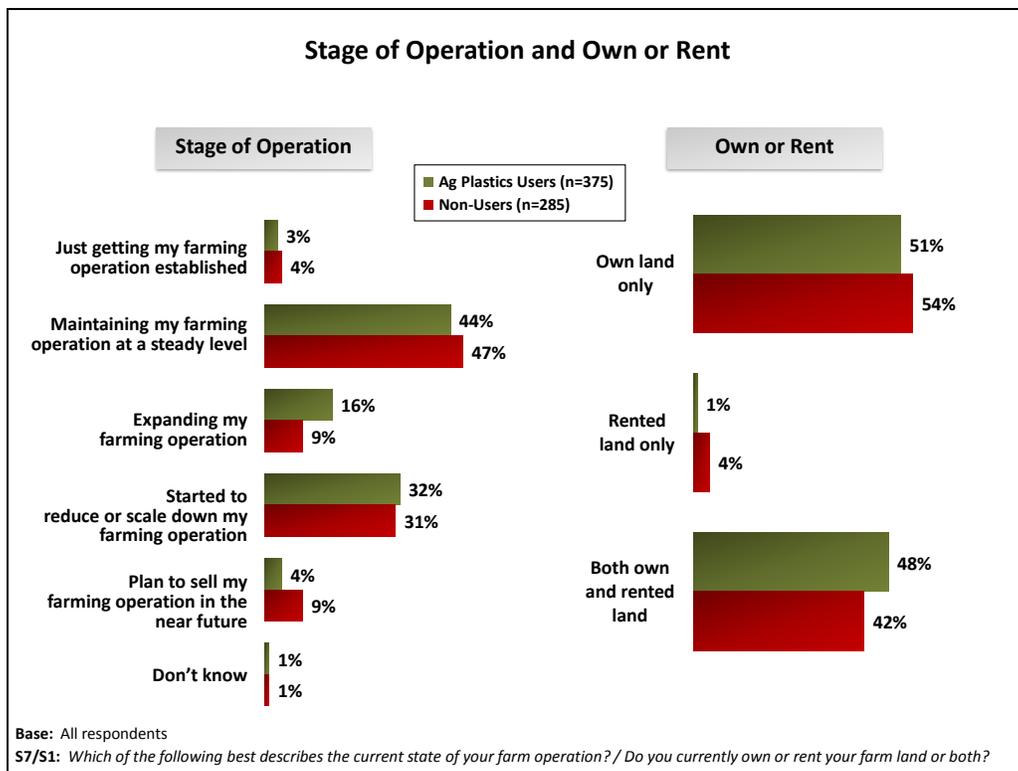
- **Gross farm sales.** Use of agricultural plastics is *higher* on larger operations. More than two-thirds (68%) of agricultural plastics users had gross farm sales of \$50K or more in 2011 compared to roughly half (51%) of non-users.
- **Stage of operation.** Significantly *more* agricultural plastics users than non-users (16% vs. 9%) are in an expansion stage.
- **Owning versus renting land.** Incidence of **renting** land only is significantly *lower* among agricultural plastics users than non-users (1% vs. 4%).
- **Types of crops.** Incidence of having acres in forages or hay is significantly *higher* among agricultural plastics users versus non-users (85% vs. 61%), while incidence of having acres in crop production (grains, oilseeds or specialty crops) is significantly *lower* (62% vs. 72%).
- **Incidence and amount of livestock.** Overall, 97% of agricultural plastics users have livestock compared to only 19% of non-users. With regards to specific types of livestock, a significantly *higher* percentage of agricultural plastics users than non-users have beef cows (92% vs. 16%, with an average of 282 vs. 77 among those who do), steers or heifers finished and shipped for slaughter (29% vs. 6%, with an average of 1,295 vs. 73), steers or heifers backgrounded and shipped or sold to be finished (52% vs. 8%, with an average of 727 vs. 81) and dairy cows (6% vs. 0%, with an average of 91 vs. 0).
- **Main source of revenue.** A significantly *lower* percentage of agricultural plastics users than non-users had crops as their main source of revenue in 2011 (25% vs. 78%). Conversely, a significantly *higher* percentage of agricultural plastics users than non-users cited livestock as their main source of revenue (49% vs. 13%) or had mixed operations (27% vs. 7%).
- **Age.** The percentage of older agricultural plastics users is significantly lower than non-users – 10% fall in the 75 years or older age category versus 19% of non-users, while the average age is 59 years (users) versus 62 years (non-users).

The charts that follow summarize farm and agricultural producer characteristics of agricultural plastics users and non-users.



Larger operations are significantly more likely to be in the maintenance or expansion stages of operation. That is, 38% of operations with less than \$50K in gross farm sales are in the maintenance phase – significantly *lower* than those with gross farm sales of \$50K to less than \$250K (50%) and \$250K or more (52%). Further, 28% of farms with gross farm sales of \$250K or more are expanding their operations, significantly *higher* than those with \$50K to less than \$250K (9%) and less than \$50K (6%) in gross farm sales.

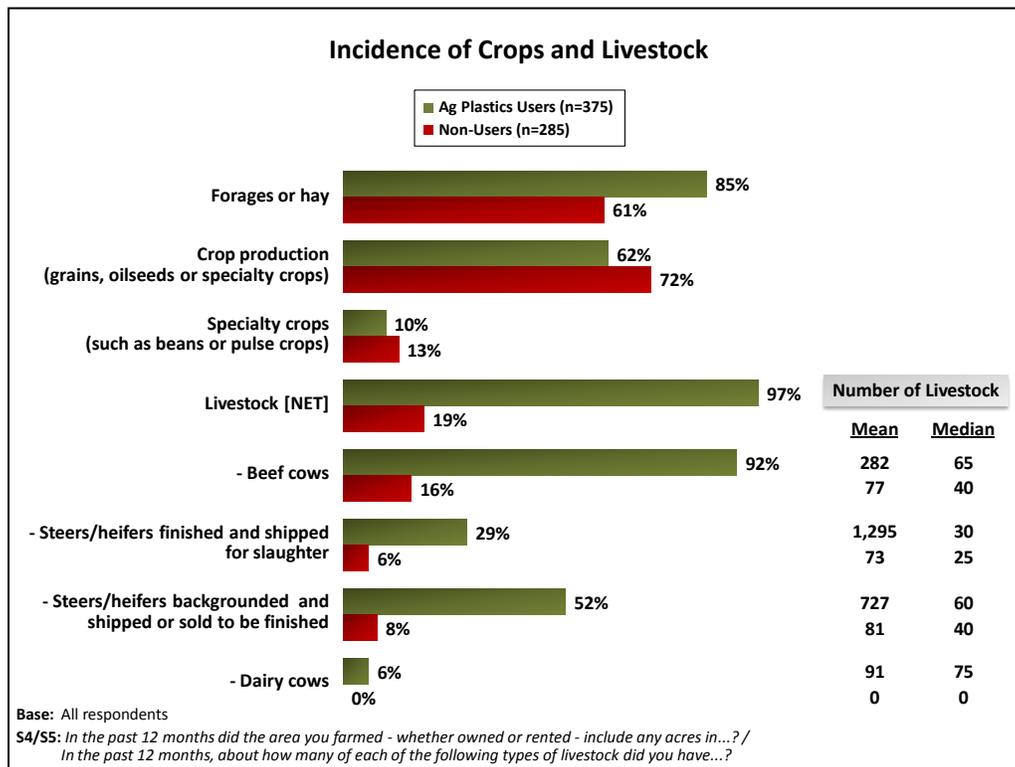
The average age of agricultural producers also varies significantly with stage of operation. Among those in an expansion stage, the average age is 51 years, compared to 57 years among those beginning or maintaining their operation and 67 years among those reducing or planning to sell their operation.

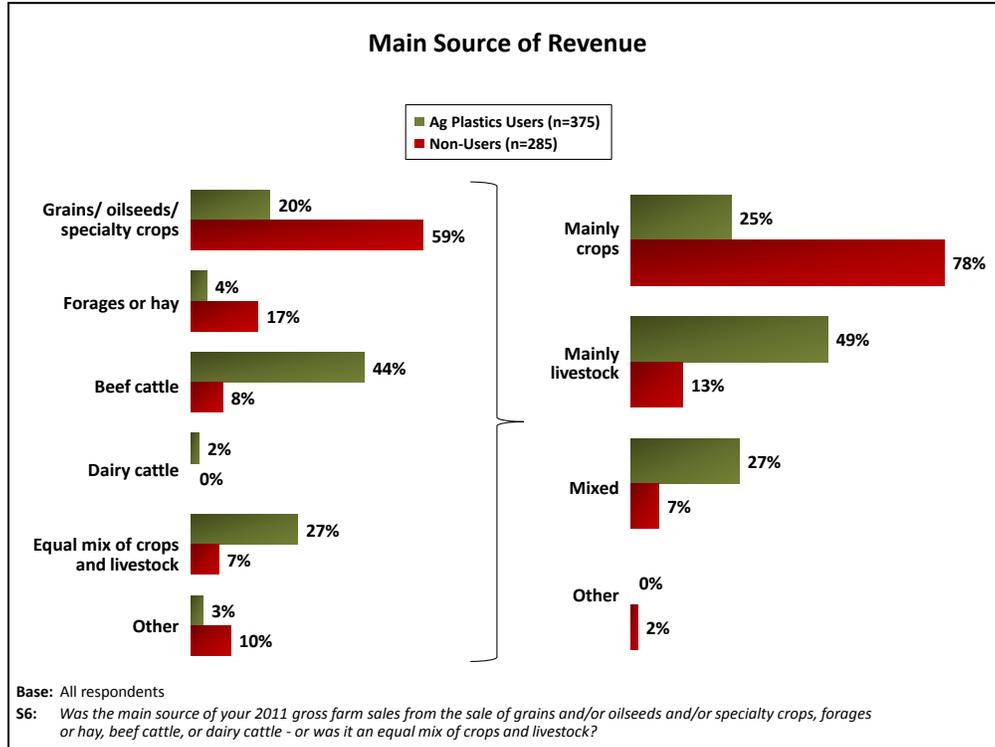


Incidence of crops varies significantly by size of operation as well as main source of revenue. Incidence of forages and hay is significantly *lower* in larger operations with \$250K or more in gross farm sales (64%) compared to those with \$50K to less than \$250K (76%) and less than \$50K (79%) in gross farm sales. Conversely, incidence of crop production *increases* significantly with gross farm sales – from 44% among those with less than \$50K to 74% among those with \$50K to less than \$250K to 90% among those with \$250K or more in gross farm sales. A similar pattern is seen for specialty crops – 4% (less than \$50K) versus 12% (\$50K to less than \$250K) versus 22% (\$250K or more).

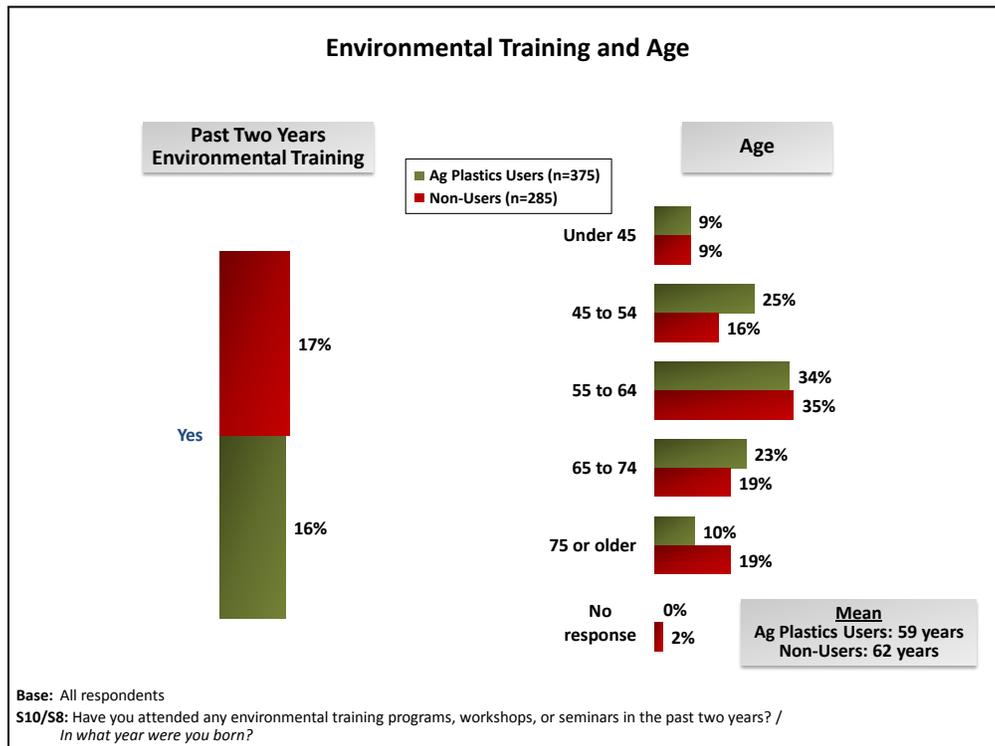
Also, among operations with forages and hay, 94% have livestock as their main source of revenue, significantly *higher* than the 83% with mixed operations and the 70% that are primarily crops. Further, among those with crop production or specialty crops, significantly *fewer* have livestock as their main source of revenue.

Incidence of steers or heifers backgrounded and shipped or sold to be finished as well as incidence of dairy cows is significantly lower on smaller operations. Among operations with less than \$50K in gross farm sales, 25% have steers or heifers backgrounded and shipped (vs. 40% of those with \$50K to less than \$250K in gross farm sales), while none (0%) have dairy cows compared to 4% of those with \$50K to less than \$250K and 8% of those with \$250K or more in gross farm sales. As one would expect, incidence of livestock is significantly lower on operations that have crops as their main source of revenue.





It is interesting to note that agricultural operators with past two years environmental training were *not* more likely to send any agricultural plastics for recycling than their counterparts without past two years training.



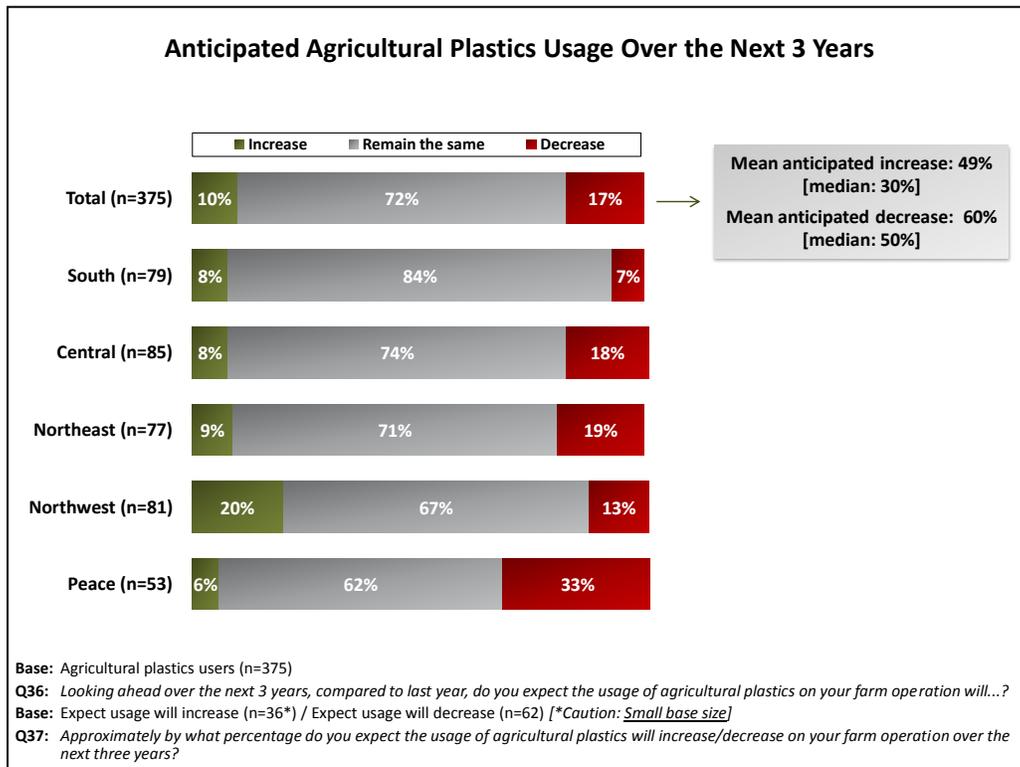
TRENDS IN AGRICULTURAL PLASTICS USAGE

Anticipated Usage over the Next Three Years

Seven-in-ten Alberta agricultural producers expect their usage of agricultural plastics to remain the same over the next three years, while just one-in-ten anticipate an increase.

Overall, 72% of agricultural producers say they expect their usage of agricultural plastics will remain the same over the next three years. Moreover, the percentage who say it will decrease (17%) outweighs the percentage who anticipate an increase (10%). The mean anticipated decrease is 60% (median is 50%), while the mean anticipated increase is 49% (median is 30%).

Regionally, the highest anticipated decrease is in the Peace region (33%), while the highest anticipated increase is in the Northwest (20%).

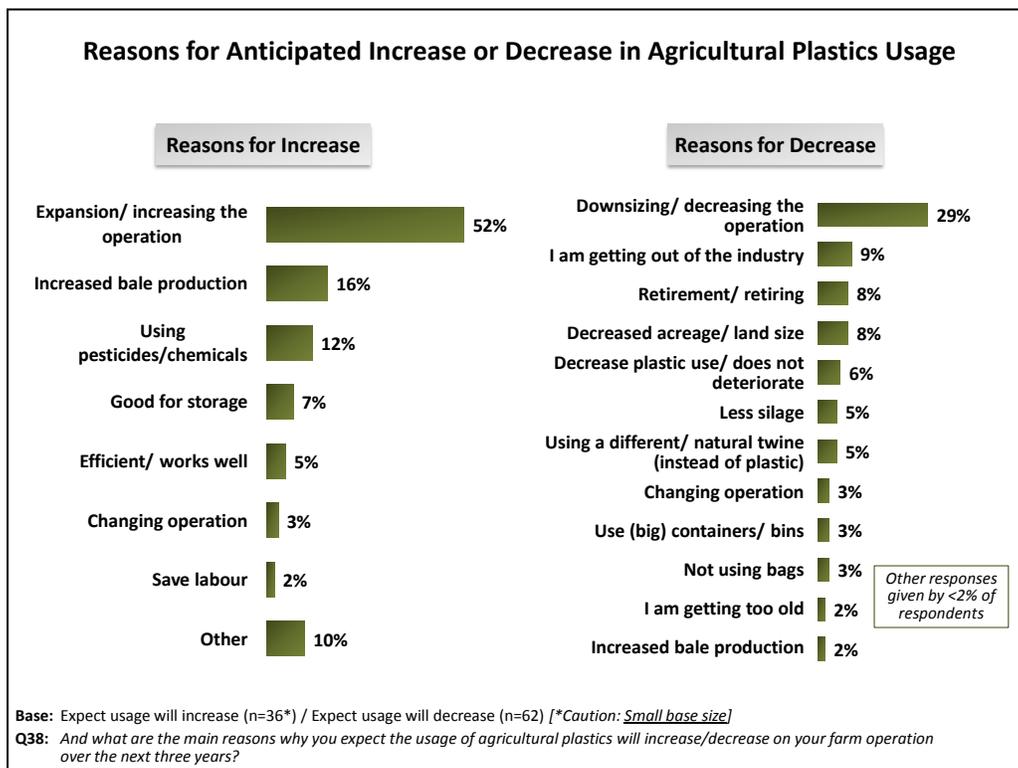


It is interesting to note that the percentage of respondents who anticipate an increase in agricultural plastics usage over the next three years does not differ significantly between operations with crops (13%) versus livestock (11%) as their main source of revenue.

Reasons for Anticipated Changes

The most frequent reason given for an anticipated increase is simply “expansion or increasing the operation” (52%). Mentions of using more plastic for convenience, efficiency or cost are low (“good for storage” (7%), “efficient/works well (5%) and “save labour” (2%).

Conversely, the most frequent reason given for an expected decrease is a decrease in the operation – “downsizing or decreasing the operation” (29%), “I am getting out of the industry” (9%), “retirement” (8%) and “decreased acreage or land size” (8%). Environmental motivations are mentioned by only a few respondents – “decrease plastic use/does not deteriorate” (6%) and “using a different or natural twine instead of plastic” (5%).



When the reason for an anticipated increase is analyzed by age, mentions of “expansion or increasing the operation” are lowest among those aged 55 years or older and highest among those under the age of 35 years. Conversely, when the reason for an anticipated decrease is analyzed by age, mentions of “I am getting out of the industry” and “I am getting too old” are limited to respondents aged 55 years or older, while mentions of “retirement/ retiring” primarily come from those aged 55 years or older.

CURRENT END OF LIFE MANAGEMENT PRACTICES

Respondents were asked how they have dealt with each type of agricultural plastic used in the past 12 months and how they deal with it most often. Please note that base sizes for all plastics other than baling twine and silage covers are very small.

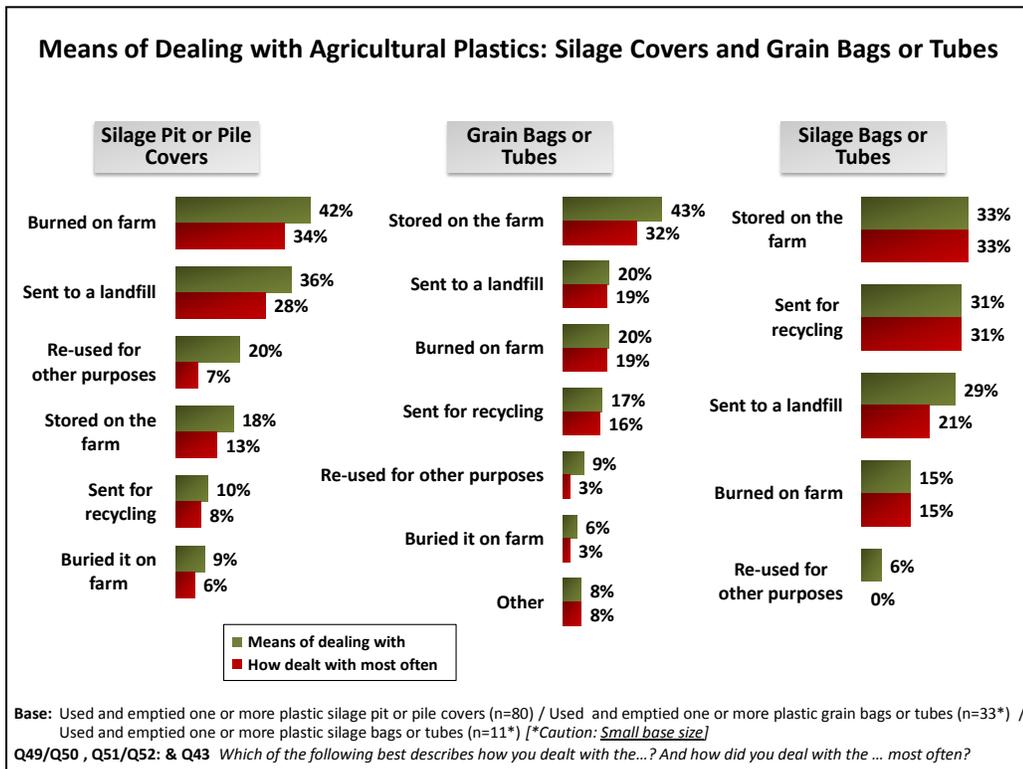
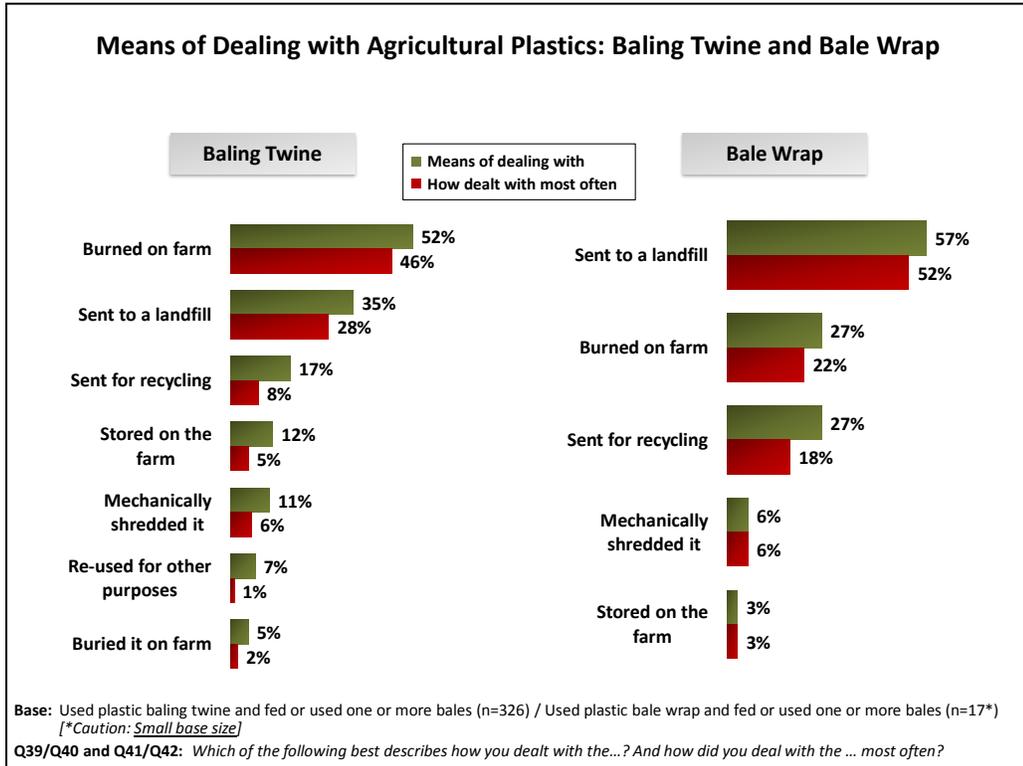
Incidence of recycling agricultural plastics is low. This holds true for each specific type of plastic: bale wrap – 27% (18% most often), grain bags or tubes – 17% (16% most often), baling twine – 17% (8% most often) and silage pit or pile covers – 10% (8% most often). Incidence of sending silage tubes or bags for recycling is 31%, however, the base size is extremely small with only 11 respondents. **Overall, 17% of agricultural plastics users sent one or more types of plastics for recycling in the past 12 months.**

The three most frequent means of dealing with each type of agricultural plastic are as follows:

- Baling twine: Burned on the farm (52%), sent to a landfill (35%) and sent for recycling (17%).
- Bale wrap: Sent to a landfill (57%), burned on the farm (27%) and sent for recycling (27%).
- Silage pit or pile covers: Burned on the farm (42%), sent to a landfill (36%) and re-used for other purposes (20%).
- Grain bags or tubes: Stored on the farm (43%), sent to a landfill (20%) and burned on the farm (20%).
- Silage bags or tubes: Stored on the farm (33%), sent for recycling (31%) and sent to a landfill (29%).
- Bale tubes: Only five respondents used and emptied one or more bale tubes – they were either sent to a landfill or burned on the farm.

It is notable that burning agricultural plastics is a common practice. While sending plastics to a landfill is also a frequent way of dealing with agricultural plastics, from the Municipal Waste Authorities survey we know a relatively small percentage is diverted.

The charts on the following page summarize current end of life practices for each type of agricultural plastic. Respondents were first asked how they dealt with each type of plastic used – multiple responses were allowed. Those who dealt with the plastic in more than one way were asked to specify how they dealt with the plastic *most often*. The ‘most often’ bars in the charts include respondents who initially selected only one response plus those who specified the means as the one most often used.

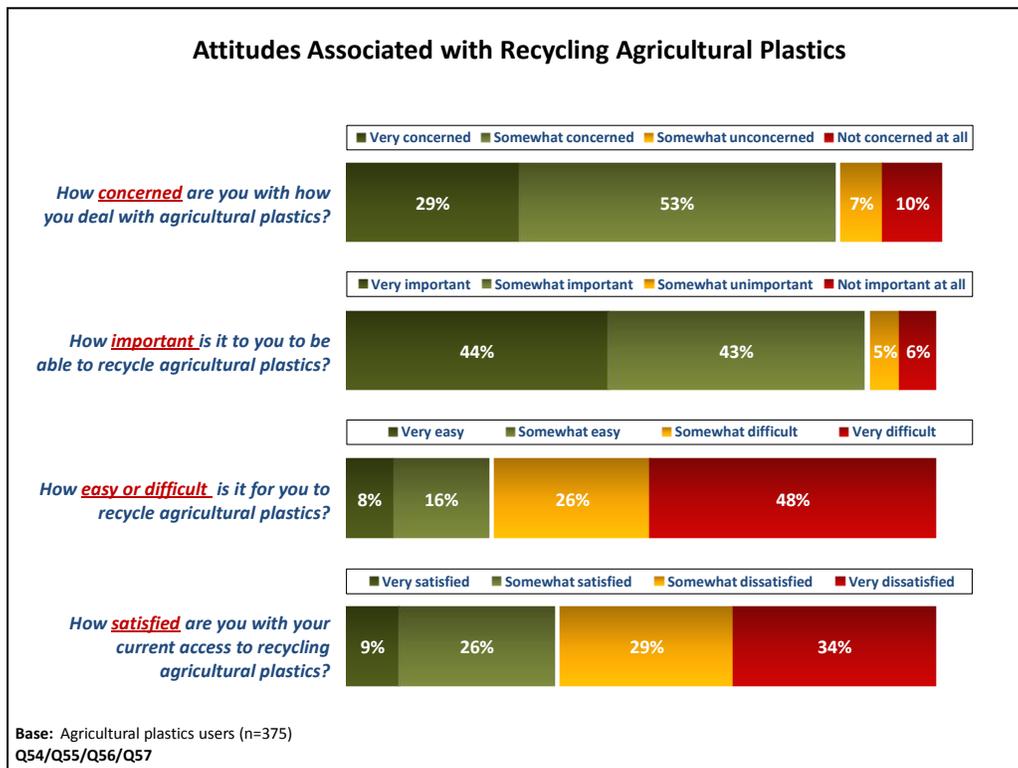


ATTITUDES AND CHALLENGES ASSOCIATED WITH HANDLING AND RECYCLING AGRICULTURAL PLASTICS

Attitudes Associated with Recycling Agricultural Plastics

There is strong consensus among agricultural plastics users that it is important to be able to recycle agricultural plastics. A clear majority, however, feel it is difficult to do so and are dissatisfied with their current access to agricultural plastics recycling.

Overall, 82% of agricultural plastics users say they are concerned about how they deal with agricultural plastics, while 87% say it is important to them to be able to recycle agricultural plastics – in fact, just under half (44%) say it is very important. The majority, however, do not feel that they can do so – 74% say it is difficult for them to recycle agricultural plastics, with half (48%) saying it is very difficult, and 63% are dissatisfied with their current access to recycling agricultural plastics.



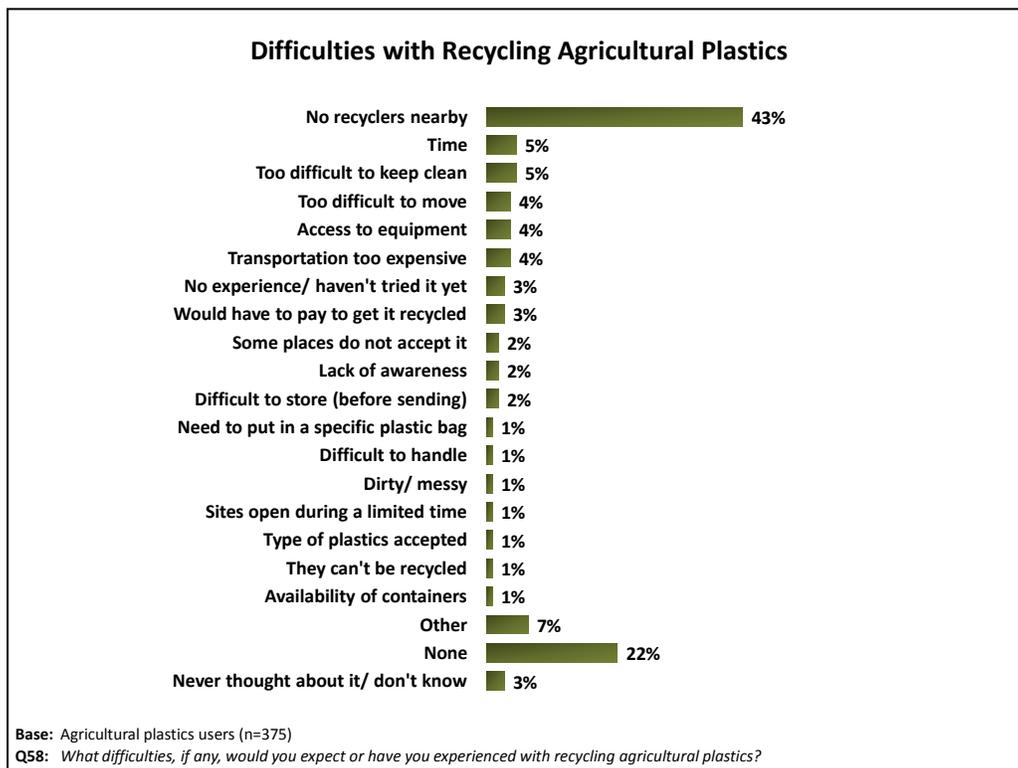
It is interesting to note that importance is significantly *higher* among producers who have sent agricultural plastics for recycling than those who have not (96% vs. 85%) as is satisfaction with their current access (61% vs. 29%) and perceived ease of recycling (47% vs. 20%). Still, even among this group, there is considerable room for improvement in both access to and ease of recycling.

Further, among larger operations, both dissatisfaction with access (73% \$250K or more and 66% \$50K to less than \$250K vs. 50% less than \$50K) and perceived difficulty of recycling (85% \$250K or more and 82% \$50K to less than \$250K vs. 43% less than \$50K) is significantly higher than for small operations.

Difficulties with Recycling Agricultural Plastics

The most frequent difficulty identified with regards to recycling agricultural plastics is by far “no recyclers nearby” (43%). Other responses related to access to recycling include, “we have to pay to get it recycled” (3%), “some places do not accept it” (2%), “sites open during a limited time” (1%), “type of plastics accepted” (1%) and “they can’t be recycled” (1%).

A wide variety of other challenges are also cited with **challenges around handling, preparing and storing agricultural plastics emerging as a theme** – “too difficult to keep clean” (5%), “too difficult to move” (4%), “difficult to store” (2%), “difficult to handle” (1%), “dirty/messy” (1%). If access to recyclers was removed as a barrier, it is likely that these types of logistical challenges would come to the forefront.

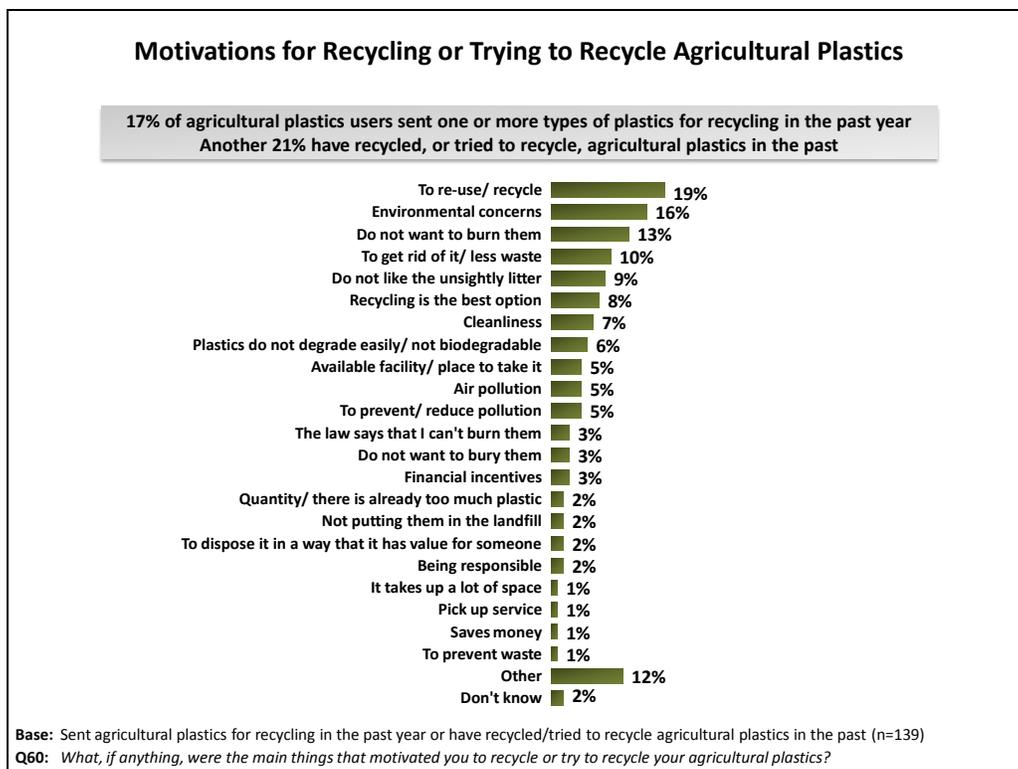


It is notable that mentions of “no recyclers nearby” are significantly higher among producers who have not sent any agricultural plastics for recycling (47% vs. 25% of those who have), whereas mentions of “time” are significantly higher among those who have recycled agricultural plastics (12% vs. 4% have not).

Motivations for Recycling Agricultural Plastics

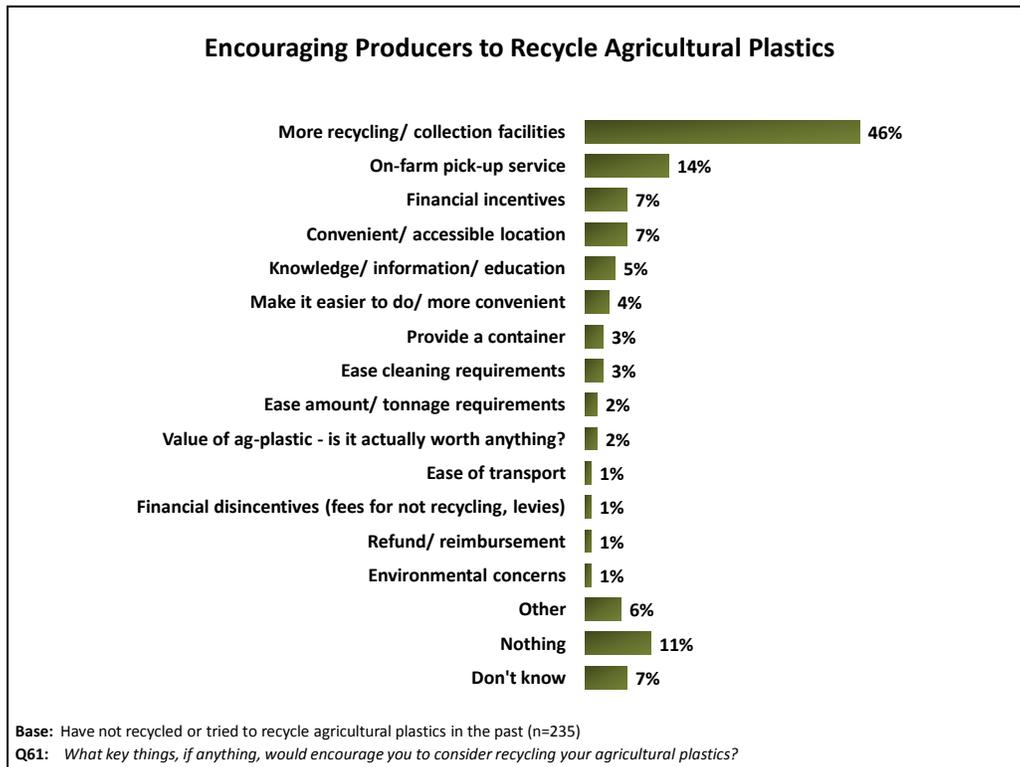
The 17% of agricultural plastics users who had sent plastics for recycling in the past twelve months as well as the additional 21% who had recycled or tried to recycle agricultural plastics in the past were asked what motivated them to do so.

A wide variety of responses were given with **environmental motivators emerging as the strongest theme** – “to re-use or recycle” (19%), “environmental concerns” (16%), “plastics do not degrade easily” (6%), “air pollution” (5%), “to prevent or reduce pollution” (5%), “quantity/there is already too much plastic” (2%), “not putting them in the landfill” (2%), “being responsible” (2%) and “to prevent waste” (1%).



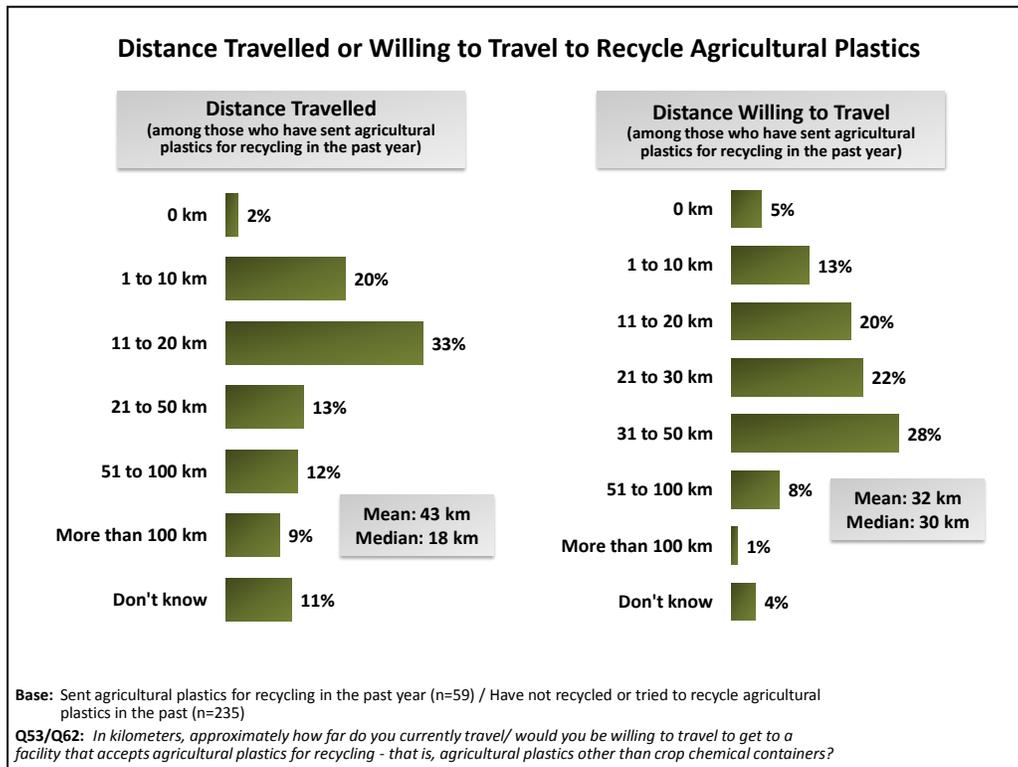
Encouraging Producers to Recycle Agricultural Plastics

For producers who had not recycled or tried to recycle agricultural plastics in the past, just under half (46%) said “more recycling or collection facilities” would encourage them to do so. “On-farm pick-up service” (14%) and “financial incentives” (7%) were the next two frequent mentions, with convenience also emerging as a theme – “convenient or accessible location” (7%), “make it easier to do or more convenient” (4%), “provide a container” (3%), “ease cleaning requirements” (2%) and “ease tonnage requirements” (2%).



Distance Travelled or Willing to Travel to Recycle Agricultural Plastics

More than half (55%) of producers who recycled agricultural plastics in the past 12 months travelled 20km or less to do so. **Among those who had not recycled or tried to recycle plastics in the past, 32km is the average distance they would be willing to travel – 50km is the outside limit with just one-in-ten (9%) said they would be willing to travel further than that.**



APPENDIX A: FORMULAS USED FOR TOTAL WEIGHT CALCULATIONS

Baling Twine

It was of interest to calculate both the total weight of baling twine used as well as the total weight of baling twine used that was eligible for recycling; if baling twine is shredded, it is not eligible for recycling.

Among all agricultural plastics users (i.e. crops, livestock or mixed), 90% reported using plastic baling twine in the past 12 months and fed or used one or more bales, while 69% did so and removed the twine (i.e. did not mechanically shred it).

The formula used to calculate the total weight was:

- Total kilograms of twine used = Number of bales fed with twine [# of bales fed * percent made with twine] * Weight of twine per bale in kilograms [distance around the bale in feet * # of wraps * average weight of twine per foot in kilograms].
- A second measure for total weight was calculated that excluded those that mechanically shredded the twine.

The mean weight of baling twine for bales fed or used and either removed or shredded was 70kg, while the mean weight of twine that would be eligible for recycling (i.e. was not shredded) was 64.2 kg.

The calculations used to estimate the total weight of baling twine used in the past 12 months on Alberta farms with \$10K or more in gross farm sales were:

- $35,527$ [# of farms with \$10K+ gross farm sales] * $.56 = 19,895$ farms in Alberta with \$10K+ gross farm revenue that used agricultural plastics in the past 12 months
- $19,895 * .90 = 17,906$ farms that used plastic baling twine in the past 12 months and fed or used one or more bales
- $17,906 * 70\text{kg} = 1,253,392$ kg (1,253 tonnes) of plastic baling twine used on fed or used bales

Baling Twine: Total Used	Removed or Shredded (n=279)
<25 kg	37%
25 to 49 kg	20%
50 to 99 kg	26%
100 to 199 kg	13%
200 to 1,999 kg	5%
Mean	70kg
Total Weight	1,253,392 kg

Using the same logic, the total weight of baling twine used in the past 12 months on Alberta farms with \$10K or more in gross farm sales that would be eligible for recycling = 856,599 kg (857 tonnes) [(19,895 * .69) * 64.2kg].

In addition to weight, the total amount of baling twine used in the past 12 months was also calculated. The mean amount of baling twine for bales fed or used and either removed or

Baling Twine: Eligible for Recycling	Removed (n=196)
<25 kg	37%
25 to 49 kg	19%
50 to 99 kg	30%
100 to 199 kg	10%
200 to 1,999 kg	4%
Mean	64.2kg
Total Weight	856,599 kg

shredded was 225,721 feet, while the mean amount of twine that would be eligible for recycling (i.e. was not shredded) was 206,727 feet. Thus, the total amount of baling twine used in the past 12 months on Alberta farms with \$10K or more in gross farm sales was 3,858,926,216 feet (17,096*225,721 feet), while the total amount that would be eligible for recycling was 2,837,855,228 feet [(19,895*.69)*206,727 feet].

Silage Pit or Pile Covers

Among all agricultural plastics users (i.e. crops, livestock or mixed), 18% reported using and emptying one or more silage pit or pile covers in the past 12 months. The formula used to calculate the total weight was:

- Total kilograms of plastic used = Number of silage pits emptied * Weight of plastic per silage pit cover in kilograms [total square feet of plastic used per silage pit cover (based on length and width) * weight of plastic in kilograms (based on thickness of plastic in mils)]

The mean weight of silage pit or pile covers used and emptied was 297.6kg. The calculations used to estimate the total weight of silage pit covers used in the past 12 months on Alberta farms with \$10K or more in gross farm sales were:

- 35,527 [# of farms with \$10K+ gross farm sales]*.56 = 19,895 farms in Alberta with \$10K+ gross farm revenue that used agricultural plastics in the past 12 months
- 19,895*.18 = 3,581 farms that used and emptied one or more plastic silage pit or pile covers in the past 12 months
- 3,581*297.6 kg = 1,065,706 kg (1,066 tonnes) of plastic silage pit or pile covers emptied

Silage Covers	(n=51)
1 to 99 kg	24%
100 to 199 kg	25%
200 to 299 kg	16%
300 to 399 kg	14%
400 to 499 kg	14%
500 to 999	1%
1,000 to 2,999 kg	6%
Mean	297.6 kg

In addition to weight, the total volume of silage pit or pile covers used and emptied in the past 12 months was also calculated. The mean volume of silage pit or pile covers used and emptied in the past 12 months was 22,336 square feet. Thus, the total volume of silage pit or pile covers used and emptied in the past 12 months was 79,985,216 square feet (3,581*22,336 square feet).

Grain Bags or Tubes

Among all agricultural plastics users (i.e. crops, livestock or mixed), 6% reported using and emptying one or more grain bags or tubes in the past 12 months. The formula used to calculate the total weight was:

- Total kilograms of plastic used = Number of grain bags or tubes emptied * Weight of plastic per grain bag or tube in kilograms [total square feet of plastic used per grain bag or tube (based on length and diameter) * weight of plastic in kilograms (based on thickness of plastic in mils)]

The mean weight of grain bags or tubes used and emptied was 811.7 kg. The calculations used to estimate the total weight of grain bags or tubes used in the past 12 months on Alberta farms with \$10K or more in gross farm sales were:

- $35,527$ [# of farms with \$10K+ gross farm sales] * $.56$ = $19,895$ farms in Alberta with \$10K+ gross farm revenue that used agricultural plastics in the past 12 months
- $19,895 * .06 = 1,194$ farms that used and emptied one or more plastic grain bags or tubes in the past 12 months
- $1,194 * 811.7 \text{ kg} = 969,170 \text{ kg}$ (969 tonnes) of grain bags or tubes emptied

Grain Bags/Tubes	(n=19)
1 to 99 kg	14%
100 to 199 kg	5%
200 to 499 kg	26%
500 to 999 kg	32%
1,000 to 1,999 kg	24%
Mean	811.7 kg

In addition to weight, the total volume of grain bags or tubes used and emptied in the past 12 months was also calculated. The mean volume of grain bags or tubes used and emptied in the past 12 months was 41,519 square feet. Thus, the total volume of grain bags or tubes used and emptied in the past 12 months was 49,573,686 square feet ($1,194 * 41,519$ square feet).

APPENDIX B: QUESTIONNAIRE

**ARD/ESRD:
2012 Ag Plastics Recycling Agricultural producer Survey
Final Questionnaire: June 13, 2012**

INTRODUCTION

Hello, my name is (FIRST NAME) and I'm calling from Ipsos Reid. On behalf of Alberta Agriculture and Rural Development, and Alberta Environment and Sustainable Resource Development, we are conducting a survey with Alberta farmers and ranchers about agricultural waste management.

The survey will take approximately 10 minutes and all your responses will be kept confidential.

I would like to speak to the person who has a key role in operating the farm.

Yes, speaking
Yes, I'll get them
No, not available

**[IF YES SPEAKING, CONTINUE]
[IF YES, I'LL GET THEM, REINTRODUCE]
[IF NO, NOT AVAILABLE, SCHEDULE CALLBACK]**

No individual information will be shared, rather, only non-identifying aggregate results will be provided to Alberta Agriculture and Rural Development and Alberta Environment and Sustainable Resource Development. All personal information is collected under the authority of, and is subject to the privacy provisions of the Freedom of Information and Privacy (FOIP) Act.

(IF RESPONDENT WISHES TO VERIFY SURVEY LEGITIMACY THEY MAY CONTACT: Dale Chrapko at Alberta Agriculture and Rural Development – Edmonton: 780-644-1969 OR Toll Free: 310-0000 (no area code) then enter 780-644-1969).

SCREENING

S1. Do you currently own or rent your farm land or both?

Own land only
Rented land only
Both own and rented land
No
Don't know

[IF NO, DON'T KNOW/NOT SURE OR REFUSE TO ANSWER, THANK & TERMINATE]

S2. What was your gross farm revenue in 2011? Please stop me when I reach your category. (READ LIST)

Under \$10,000
\$10,000 to under \$25,000
\$25,000 to under \$50,000
\$50,000 to under \$100,000
\$100,000 to under \$250,000
\$250,000 to under \$500,000
\$500,000 to under \$1,000,000
\$1,000,000 to under \$2,000,000
\$2,000,000 or more
Don't know

[THANK & TERMINATE IF UNDER \$10,000, DK/NS OR REF]

[ASK S3 ONLY IF CENSUS DIVISION IS NOT PROVIDED IN THE SAMPLE FILE]

S3. In order to ensure we have representation from all regions of Alberta, could you please tell me in which County or Municipal District your farm is located (DO NOT READ LIST) (IF NECESSARY: I assure you that this information will only be used for classification purposes. Individual results will not be shared with ARD or ESRD)

Acadia, M.D. of
Athabasca County
Barrhead, County of
Beaver County
Big Lakes, M.D. of
Bighorn, M.D. of
Birch Hills County
Bonnyville, M.D. of
Brazeau County
Camrose County
Calgary
Cardston County
Clear Hills County
Clearwater County
Consort
Cypress County
Edmonton
Fairview, M.D. of
Flagstaff County
Foothills, M.D. of
Fort McMurray
Forty Mile, County of
Grande Prairie, County of
Greenview, M.D. of
Hanna
Kneehill County

Lac La Biche County
Lac Ste. Anne County
Lacombe County
Lamont County
Leduc County
Lesser Slave River, M.D. of
Lethbridge, County of
MacKenzie, M.D. of
Medicine Hat
Minburn, County of
Mountain View County
Newell, County of
Northern Lights, County of
Northern Sunrise County
Opportunity, M.D. of
Paintearth, County of
Parkland County
Peace, M.D. of / Peace River
Pincher Creek, M.D. of
Ponoka County
Provost, M.D. of
Ranchland, M.D. of
Red Deer County
Rocky View County
Saddle Hills County
Smoky Lake County
Smoky River, M.D. of
Spirit River, M.D. of
St. Paul, County of
Starland County
Stettler, County of
Strathcona County
Sturgeon County
Taber, M.D. of
Thorhild, County of
Two Hills, County of
Vermilion River, County of
Vulcan County
Wainwright, M.D. of
Warner, County of
Westlock County
Wetaskiwin, County of
Wheatland County
Willow Creek, M.D. of
Wood Buffalo, Regional Municipality of
Woodlands County
Yellowhead County

None of the above
Don't know

**[IF NONE OF THE ABOVE, DON'T KNOW/NOT SURE OR REFUSE TO ANSWER, THANK & TERMINATE]
IF DON'T KNOW/NOT SURE OR REFUSE TO ANSWER, THANK & TERMINATE]
[ASSIGN CENSUS DIVISION BASED ON RESPONSE TO S3]**

S4. In the past 12 months did the area you farmed – whether owned or rented – include any acres in...? (READ LIST)

Crop production, that is, grains, specialty crops and/or oilseeds
Forages or hay
Specialty crops such as beans and/or pulse crops

Yes
No
Don't Know

[IF DON'T KNOW/REFUSE TO ANSWER TO ANY ITEM IN S4, THANK & TERMINATE]

S5. In the past 12 months, about how many of each of the following types of livestock did you have...? (READ LIST) (RECORD RESPONSE FOR EACH ITEM)

Beef cows
Steers and/or heifers in total you finished and shipped for slaughter
Steers and/or heifers you backgrounded and shipped or sold to be finished
Dairy cows

[NUMERIC RESPONSE. RANGE: 0 TO 999,999.]

IF DON'T KNOW/REFUSE TO ANSWER TO ANY ITEM IN S5, THANK & TERMINATE]

[IF NO TO ALL ITEMS IN S4 AND ZERO/NONE TO ALL ITEMS IN S5, THANK & TERMINATE]

[THANK & TERMINATE: Thank you, but our survey is with farmers who have crops and/or cattle. We hope that we will be able to complete a survey with you on a different topic in the near future.]

S6. Was the main source of your 2011 gross farm sales from the sale of grains and/or oilseeds and/or specialty crops, forages or hay, beef cattle, or dairy cattle – or was it an equal mix of crops and livestock? (DO NOT READ LIST)

Grains and/or oilseeds and/or specialty crops (beans and/or pulse crops)
Forages or hay
Beef cattle
Dairy cattle
Equal mix of crops and livestock
Other (specify)

[IF DON'T KNOW/REFUSE TO ANSWER S6, THANK & TERMINATE]

[IF GRAINS AND/OR OILSEEDS AND/OR SPECIALTY CROPS OR FORAGES OR HAY SELECTED – CLASSIFY AS “MAINLY CROP”]

[IF BEEF CATTLE OR DAIRY CATTLE SELECTED – CLASSIFY AS ‘MAINLY LIVESTOCK’]

[IF EQUAL MIX OF CROPS AND LIVESTOCK – CLASSIFY AS “MIXED”]

[IF OTHER SELECTED – CLASSIFY AS “OTHER”]

S7. Which of the following best describes the current state of your farm operation? **(READ LIST)**

[ACCEPT ONE RESPONSE ONLY]

- I am just getting my farming operation established
- I am maintaining my farming operation at a steady level
- I am expanding my farming operation
- I have started to reduce or scale down my farming operation
- I plan to sell my farming operation in the near future
- (DO NOT READ) Don't know

S8. In what year were you born?

NUMERIC FIELD [RANGE: 1900 TO 1996]

Decline to respond

S9. And which of the following types of agricultural plastics did you use on your farm operation in the past 12 months? **(READ LIST)**

[INSERT NEXT 7 ITEMS IF 1 OR MORE TO ANY ITEM IN S5]

Plastic baling twine

Plastic Net wrap – to wrap dry hay bales - used instead of baler twine

Plastic Bale Wrap – stretch plastic wrap applied to individual bales in several layers - used to bale forage crops for silage or haylage

Plastic Bale tubes – long plastic tubes about 4 to 6 feet in diameter and about 100 feet long – that accommodate several bales of silage or haylage stacked end-to-end within one sealed unit.

Plastic Bale bags – instead of being stored in long plastic tubes, bales of silage or haylage are stored in individual plastic bags

Plastic Silage bags or tubes – long plastic tubes about 8 to 12 feet in diameter and about 100 to 300 feet long used to store silage or high moisture grain

Plastic Silage pit or pile covers - also called flat sheeting – used to cover silage or high moisture feeds stored in bunkers or outside storage areas

[INSERT NEXT ITEM IF YES TO CROP PRODUCTION IN S4]

Plastic Grain bags or tubes – long plastic bags that are about 9 to 10 feet in diameter and about 200 to 300 feet long

Yes

No

S10. Have you attended any environmental training programs, workshops, or seminars in the past two years? (DO NOT READ LIST)

- Yes
- No
- Maybe/Perhaps
- Don't know

[IF NO TO ALL ITEMS IN S9, GO TO CLOSE. IF YES TO ONLY PLASTIC NET WRAP IN S9, GO TO CLOSE. IF YES TO ANY OTHER ITEM IN S9 CONTINUE]

[CLOSE] Thank you, but our survey is about the use of agricultural plastics other than plastic net wrap. We hope that we will be able to complete a survey with you on a different topic in the near future.

SECTION 1: AMOUNTS OF AG PLASTICS USED IN 2011

Next I'd like to ask a few questions about the agricultural plastics you used in the past 12 months.

[IF PLASTIC BALING TWINE SELECTED IN S9, CONTINUE – OTHERWISE SKIP TO Q.11]

1. About how many of each of the following types of bales of hay or forage bales were fed in the past 12 months? (READ LIST)

TYPE OF BALES

- Small square bales [RANGE: 0 TO 999,999]
- Large square bales [RANGE: 0 TO 999,999]
- Round bales [RANGE: 0 TO 999,999]

[IF ZERO FOR ALL THREE BALES SIZES, SKIP TO Q.6]

[FOR EACH TYPE OF BALE >0 IN Q.1 ASK:]

2. And about what percentage of [INSERT TYPE OF BALE > 0 IN Q.1] of hay or forage that was fed in the past 12 months was made using plastic baler twine?

TYPE OF BALES

- Small square bales
- Large square bales
- Round bales

[NUMERIC RESPONSE. RANGE: 0 TO 100] %

[READ QUESTIONS 3, 4 AND 5 FOR EACH TYPE OF BALE > 0 IN Q.2 BEFORE MOVING ON TO NEXT TYPE OF BALE > 0 IN Q.2]

3. And thinking about the dimensions in feet, what was the most common size of **the [INSERT TYPE OF BALE > 0 IN Q.2]** of hay or forage that were fed in the past 12 months - and made using plastic baler twine? (DO NOT READ LIST)

SMALL SQUARE BALE SIZE LIST

2' (wide) x 2' (tall) x 4' (long)

Other (specify)

LARGE SQUARE BALE SIZE LIST

3' (wide) x 4' (tall) x 8' (long)

4' (wide) x 4' (tall) x 8' (long)

3' (wide) x 3' (tall) x 8' (long)

Other (specify)

ROUND BALE SIZE LIST

4' x 4'

4' X 5'

4' X 6'

5' X 5'

6' X 6'

Other (specify)

4. DELETED

5. Did you remove the plastic twine or did you mechanically shred the plastic twine that was used on the **[INSERT TYPE OF BALE > 0 IN Q.2]** of hay or forage you fed in the past 12 months?

Removed it

Mechanically shredded it

6. About how many of each of the following types of bales of straw were used in the past 12 months? (READ LIST)

TYPE OF BALES

Small square bales [RANGE: 0 TO 999,999]

Large square bales [RANGE: 0 TO 999,999]

Round bales [RANGE: 0 TO 999,999]

[IF ZERO TO ALL THREE BALE SIZES, SKIP TO Q.11]

[FOR EACH TYPE OF BALE >0 IN Q.6 ASK:]

7. And about what percentage of **[INSERT TYPE OF BALE > 0 IN Q.6]** of straw that were used in the past 12 months were made using plastic baler twine?

TYPE OF BALES

Small square bales
Large square bales
Round bales

[NUMERIC RESPONSE. RANGE: 0 TO 100] %

[READ QUESTIONS 8, 9 AND 10 FOR EACH TYPE OF BALE > 0 IN Q.7 BEFORE MOVING ON TO NEXT TYPE OF BALE > 0 IN Q.7]

8. And thinking about the dimensions in feet, what was the most common size of the **[INSERT TYPE OF BALE > 0 IN Q.7]** of straw that were used in the past 12 months - and made using plastic baler twine? (DO NOT READ LIST)

SMALL SQUARE BALE SIZE LIST

2' (wide) x 2' (tall) x 4' (long)
Other (specify)

LARGE SQUARE BALE SIZE LIST

3' (wide) x 4' (tall) x 8' (long)
4' (wide) x 4' (tall) x 8' (long)
3' (wide) x 3' (tall) x 8' (long)
Other (specify)

ROUND BALE SIZE LIST

4' x 4'
4' X 5'
4' X 6'
5' X 5'
6' X 6'
Other (specify)

9. DELETED

10. Did you remove the plastic twine or did you mechanically shred the plastic twine that was used on the **[INSERT TYPE OF BALE > 0 IN Q.7]** of straw you used in the past 12 months?

Removed it
Mechanically shredded it

[IF PLASTIC BALE WRAP SELECTED IN S9, CONTINUE – OTHERWISE SKIP TO Q.16]

11. Now thinking about the stretch plastic bale wrap you used in the past 12 months, which of the following types of bales were individually wrapped in stretch plastic wrap and fed in the past 12 months (READ LIST)? (ACCEPT MULTIPLE RESPONSES)

TYPE OF BALES

Large square bales

Round bales

(DO NOT READ) Neither /Other (specify)

[IF NEITHER OR OTHER TYPE OF BALE OR DK/REF TO Q.11, SKIP TO Q.16]

12. And about how many **[INSERT TYPE OF BALE MENTIONED IN Q.11]** that were fed in the past 12 months were individually wrapped in stretch plastic wrap?

TYPE OF BALES

Large square bales [RANGE: 0 TO 999,999]

Round bales [RANGE: 0 TO 999,999]

[READ QUESTIONS 13, 14 AND 15 FOR EACH TYPE OF BALE > 0 IN Q.12 BEFORE MOVING ON TO NEXT TYPE OF BALE > 0 IN Q.12]

13. And thinking about the dimensions in feet, what was the common size of the **[INSERT TYPE OF BALE > 0 IN Q.12]** you fed in the past 12 months that were individually wrapped in plastic stretch wrap? (DO NOT READ LIST)

LARGE SQUARE BALE LIST

3' (wide) x 4' (tall) x 8' (long)

4' (wide) x 4' (tall) x 8' (long)

3' (wide) x 3' (tall) x 8' (long)

Other (specify)

ROUND BALE SIZE LIST

4' x 4'

4' x 5'

4' x 6'

5' x 5'

6' x 6'

Other (specify)

14. And how many wraps of plastic were used on the most common size of the **[INSERT TYPE OF BALE > 0 IN Q.12]** you fed in the past 12 months?

[NUMERIC RESPONSE. RANGE: 1 TO 99.]

15. In mils, what was the thickness of the plastic wrap that was used on the most common size of **[INSERT TYPE OF BALE > 0 IN Q.12]** you fed in the past 12 months?

[NUMERIC RESPONSE. RANGE: 1 TO 99.] mils

[IF PLASTIC BALE TUBES SELECTED IN S9, CONTINUE – OTHERWISE SKIP TO Q.20]

16. Now thinking of plastic bale tubes, about how many bale tubes were emptied in the past 12 months?

[NUMERIC RESPONSE. RANGE: 0 TO 9,999.]

[IF NONE OR DK/REF TO Q.16, SKIP TO Q.20]

17. In feet, what was the length of most commonly used bale tubes that were emptied in the past 12 months?

[NUMERIC RESPONSE. RANGE: 1 TO 999.]feet

18. In feet, what was the diameter of the most commonly used bale tubes that were emptied in the past 12 months?

[NUMERIC RESPONSE. RANGE: 1 TO 99.]feet

19. In mils, what was the thickness of the plastic of the most commonly used bale tubes that were emptied in the past 12 months?

[NUMERIC RESPONSE. RANGE: 1 TO 99.] mils

[IF PLASTIC BALE BAGS SELECTED IN S9, CONTINUE – OTHERWISE SKIP TO Q.24]

20. Now thinking about the plastic bale bags you used in the past 12 months, which of the following types of bales were stored in plastic bale bags and fed in the past 12 months (READ LIST)? (ACCEPT MULTIPLE RESPONSES)

TYPE OF BALES

Large square bales

Round bales

(DO NOT READ) Neither/Other (specify)

[IF NEITHER OR OTHER TYPE OF BALE OR DK/REF AT Q.20, SKIP TO Q.24]

21. About how many of the **[INSERT TYPE OF BALE MENTIONED IN Q.20]** that were fed in the past 12 months were stored in plastic bale bags?

TYPE OF BALES

Large square bales [RANGE: 0 TO 999,999]

Round bales [RANGE: 0 TO 999,999]

[READ QUESTIONS 22 AND 23 FOR EACH TYPE OF BALE > 0 IN Q.21 BEFORE MOVING ON TO NEXT TYPE OF BALE > 0 IN Q.21]

22. And thinking about the dimensions in feet, what was the most common size of the **[INSERT TYPE OF BALE > 0 IN Q.21]** you fed in the past 12 months were stored in plastic bale bags? (DO NOT READ LIST)

LARGE SQUARE BALE LIST

3' (wide) x 4' (tall) x 8' (long)

4' (wide) x 4' (tall) x 8' (long)

3' (wide) x 3' (tall) x 8' (long)

Other (specify)

ROUND BALE SIZE LIST

4' x 4'

4' X 5'

4' X 6'

5' X 5'

6' X 6'

Other (specify)

23. In mils, what was the thickness of the plastic for the plastic bale bags used for the most common size of **[INSERT TYPE OF BALE > 0 IN Q.21]** you fed in the past 12 months?

[NUMERIC RESPONSE. RANGE: 1 TO 99.] mils

[IF PLASTIC SILAGE BAGS SELECTED IN S9, CONTINUE – OTHERWISE SKIP TO Q.28]

24. Now thinking of plastic silage bags or tubes, about how many silage bags or tubes were emptied in the past 12 months?

[NUMERIC RESPONSE. RANGE: 0 TO 9,999.]

[IF NONE OR DK/REF AT Q24, SKIP TO INSTRUCTION BEFORE Q28]

25. In feet, what was the length of the most commonly used silage bags or tubes that were emptied in the past 12 months?

[NUMERIC RESPONSE. RANGE: 1 TO 999.] feet

26. In feet, what was the diameter of the most commonly used silage bags or tubes that were emptied in the past 12 months?

[NUMERIC RESPONSE. RANGE: 1 TO 99.] feet

27. In mils, what was the thickness of the plastic of the most commonly used silage bags or tubes that were emptied in the past 12 months?

[NUMERIC RESPONSE. RANGE: 1 TO 99.] mils

[IF SILAGE PIT OR PILE COVERS SELECTED IN S9, CONTINUE – OTHERWISE SKIP TO Q.32]

28. Now thinking of silage pit or pile covers, about how many of the silage pits or piles that were emptied in the past 12 months were covered with a plastic cover?

[NUMERIC RESPONSE. RANGE: 0 TO 999.]

[IF NONE OR DK/REF TO Q.28, SKIP TO INSTRUCTION BEFORE Q.32]

29. In feet, what was the length of the most commonly used plastic cover used for the silage pits or piles that were emptied in the past 12 months?

[NUMERIC RESPONSE. RANGE: 1 TO 999] feet

30. In feet, what was the width of the most commonly used plastic cover used for the silage pits or piles that were emptied in the past 12 months?

[NUMERIC RESPONSE. RANGE: 1 TO 999.] feet

31. In mils, what was the thickness of the plastic of the most commonly used plastic covers for the silage pits or piles that were emptied in the past 12 months?

[NUMERIC RESPONSE. RANGE: 1 TO 99.] mils

[IF PLASTIC GRAIN BAGS SELECTED IN S9, CONTINUE – OTHERWISE SKIP TO Q.36]

32. Now thinking about plastic grain bags or tubes, about how many grain bags or tubes were emptied in the past 12 months?

[NUMERIC RESPONSE. RANGE: 0 TO 999.]

[IF NONE OR DK/REF AT Q32, SKIP TO INTRODUCTION BEFORE Q36]

33. In feet, what was the length of the most commonly used grain bags or tubes that were emptied in the past 12 months?

[NUMERIC RESPONSE. RANGE: 1 TO 999.] feet

34. In feet, what was the diameter of the most commonly used grain bags or tubes that were emptied in the past 12 months?

[NUMERIC RESPONSE. RANGE: 1 TO 99.] feet

35. In mils, what was the thickness of the plastic of the most commonly used grain bags or tubes that were emptied in the past 12 months?

[NUMERIC RESPONSE. RANGE: 1 TO 99.] mils

SECTION 2: TRENDS

For the next set of questions, please keep in mind that for the purposes of this survey, the term **agricultural plastics** does **not include** crop chemical containers. (IF NECESSARY: Agricultural plastics includes plastic baling twine, plastic net wrap, plastic bale wrap, plastic bale tubes, plastic silage bags or tubes, plastic silage pit or pile covers and plastic grain bags or tubes)

36. Looking ahead over the next 3 years, compared to last year, do you expect the usage of agricultural plastics on your farm operation will...? (READ LIST)

Increase

Decrease

Or, do you expect it will remain about the same

Don't know (DO NOT READ)

[IF INCREASE OR DECREASE MENTIONED IN Q.36, CONTINUE – OTHERWISE SKIP TO Q.39]

37. Approximately by what percentage do you expect the usage of agricultural plastics will **[INSERT MENTION IN Q.36]** on your farm operation over the next three years?

[RANGE: 0 TO 10,000] %

38. And what are the main reasons why you expect the usage of agricultural plastics will **[INSERT MENTION IN Q.36]** on your farm operation over the next three years?

[VERBATIM RESPONSE]

SECTION 3: CURRENT END OF LIFE MANAGEMENT PRACTICES

[IF PLASTIC BALER TWINE SELECTED IN S9 AND 1 OR MORE FOR AT LEAST ONE BALE TYPE AT Q1 AND/OR Q6, CONTINUE – OTHERWISE SKIP TO Q.41]

39. Which of the following best describes how you dealt with the plastic baler twine from the bales you fed or used in the past 12 months? (READ LIST) (ACCEPT ALL RESPONSES)

LIST

Stored on the farm

Re-used for other purposes

Disposed of by burying it on farm

Sent for recycling

Sent to a landfill

Burned on farm

Mechanically shredded it

Other (specify)

[IF MORE THAN ONE MENTION IN Q.39, CONTINUE – OTHERWISE SKIP TO Q.41]

40. And how did you deal with the plastic baler twine most often? (READ LIST ONLY IF NECESSARY)

LIST

[INSERT ITEMS FROM Q39]

[IF PLASTIC BALE WRAP SELECTED IN S9 AND 1 OR MORE FOR AT LEAST ONE BALE TYPE AT Q12, CONTINUE – OTHERWISE SKIP TO Q.43]

41. Which of the following best describes how you dealt with the plastic stretch wrap from the bales you fed or used in the past 12 months? (READ LIST) (ACCEPT MULTIPLE RESPONSES)

LIST

Stored on the farm
Re-used for other purposes
Disposed of by burying it on farm
Sent for recycling
Sent to a landfill
Burned on farm
Other (specify)

[IF MORE THAN ONE MENTION IN Q.41, CONTINUE – OTHERWISE SKIP TO Q.43]

42. And how did you deal with the plastic stretch wrap most often? (READ LIST ONLY IF NECESSARY)

LIST

[INSERT ITEMS FROM Q41]

[IF PLASTIC BALE TUBES SELECTED IN S9 AND 1 OR MORE AT Q16, CONTINUE – OTHERWISE SKIP TO Q.45]

43. Which of the following best describes how you dealt with the plastic bale tubes you emptied in the past 12 months? (READ LIST) (ACCEPT MULTIPLE RESPONSES)

LIST

Stored on the farm
Re-used for other purposes
Disposed of by burying it on farm
Sent for recycling
Sent to a landfill
Burned on farm
Other (specify)

[IF MORE THAN ONE MENTION IN Q.43, CONTINUE – OTHERWISE SKIP TO Q.45]

44. And how did you deal with the emptied plastic bale tubes most often? (READ LIST ONLY IF NECESSARY)

LIST

[INSERT ITEMS FROM Q43]

[IF PLASTIC BALE BAGS SELECTED IN S9 AND 1 OR MORE FOR AT LEAST ONE BALE TYPE AT Q21, CONTINUE – OTHERWISE SKIP TO Q.47]

45. Which of the following best describes how you dealt with the plastic bale bags from the bales you fed or used in the past 12 months? (READ LIST) (ACCEPT MULTIPLE RESPONSES)

LIST

Stored on the farm
Re-used for other purposes
Disposed of by burying it on farm
Sent for recycling
Sent to a landfill
Burned on farm
Other (specify)

[IF MORE THAN ONE MENTION IN Q.45, CONTINUE – OTHERWISE SKIP TO Q.47]

46. And how did you deal with the plastic bale bags most often? (READ LIST ONLY IF NECESSARY)

LIST

[INSERT ITEMS FROM Q45]

[IF PLASTIC SILAGE BAGS SELECTED IN S9 AND 1 OR MORE AT Q24, CONTINUE – OTHERWISE SKIP TO Q.49]

47. Which of the following best describes how you dealt with the plastic silage bags or tubes you emptied in the past 12 months? (READ LIST) (ACCEPT MULTIPLE RESPONSES)

LIST

Stored on the farm
Re-used for other purposes
Disposed of by burying it on farm
Sent for recycling
Sent to a landfill
Burned on farm
Other (specify)

[IF MORE THAN ONE MENTION IN Q.47, CONTINUE – OTHERWISE SKIP TO Q.49]

48. And how did you deal with the emptied plastic silage bags or tubes most often? (READ LIST ONLY IF NECESSARY)

LIST

[INSERT ITEMS FROM Q47]

[IF PLASTIC SILAGE PIT OR PILE COVERS SELECTED IN S9 AND 1 OR MORE AT Q28, CONTINUE – OTHERWISE SKIP TO Q.51]

49. Which of the following best describes how you dealt with the plastic covers from the silage pits or piles you emptied in the past 12 months? (READ LIST) (ACCEPT MULTIPLE RESPONSES)

LIST

Stored on the farm
Re-used for other purposes
Disposed of by burying it on farm
Sent for recycling
Sent to a landfill
Burned on farm
Other (specify)

[IF MORE THAN ONE MENTION IN Q.49, CONTINUE – OTHERWISE SKIP TO Q.51]

50. And how did you deal with the plastic covers from the silage pits or piles most often? (READ LIST ONLY IF NECESSARY)

LIST

[INSERT ITEMS FROM Q49]

[IF PLASTIC GRAIN BAGS SELECTED IN S9 AND 1 OR MORE AT Q32, CONTINUE – OTHERWISE SKIP TO Q.53]

51. Which of the following best describes how you dealt with the plastic grain bags that you emptied in the past 12 months? (READ LIST) (ACCEPT MULTIPLE RESPONSES)

LIST

Stored on the farm
Re-used for other purposes
Disposed of by burying it on farm
Sent for recycling
Sent to a landfill
Burned on farm
Other (specify)

[IF MORE THAN ONE MENTION IN Q.51, CONTINUE – OTHERWISE SKIP TO Q.53]

52. And how did you deal with the emptied plastic grain bags most often? (READ LIST ONLY IF NECESSARY)

LIST

[INSERT ITEMS FROM Q51]

[IF “SENT FOR RECYCLING” SELECTED IN Q.39, Q.41, Q.43, Q.45, Q.47, Q.49, Q.51, CONTINUE – OTHERWISE SKIP TO Q.54]

53. In kilometers, approximately how far do you currently travel to get to a facility that accepts agricultural plastics for recycling – that is, agricultural plastics other than crop chemical containers?

[NUMERIC RESPONSE. RANGE: 0 TO 999] kilometres

SECTION 4: ATTITUDES AND CHALLENGES ASSOCIATED WITH HANDLING AND RECYCLING AGRICULTURAL PLASTICS

Next, we would like to get your views on managing agricultural plastics. Again, please keep in mind that for the purposes of this survey, the term **agricultural plastics** does **not include** crop chemical containers.

54. Which of the following best describes how concerned you are with how you deal with agricultural plastics? (READ LIST)

Very concerned
Somewhat concerned
Somewhat unconcerned
Not concerned at all

55. And which of the following best describes how important it is to you to be able to recycle agricultural plastics? (READ LIST)

Very important
Somewhat important
Somewhat unimportant
Not important at all

56. And which of the following best describes how easy or difficult it is for you to recycle agricultural plastics? (READ LIST)

Very easy
Somewhat easy
Somewhat difficult
Very difficult

57. And which of the following best describes your level of satisfaction with your current access to recycling agricultural plastics? (READ LIST)

Very satisfied
Somewhat satisfied
Somewhat dissatisfied
Very dissatisfied

58. What difficulties, if any, would you expect or have you experienced with recycling agricultural plastics? (DO NOT READ LIST) (ACCEPT MULTIPLE RESPONSES)

LIST

No recyclers nearby
Would have to pay to get it recycled
Too difficult to move
Too difficult to keep clean
Access to equipment
Transportation too expensive
Time

Other (specify)
Never thought about it/don't know
None

[IF "SENT FOR RECYCLING" NOT SELECTED IN Q.39, Q.41, Q.43, Q.45, Q.47, Q.49, Q.51, CONTINUE – OTHERWISE SKIP TO Q.60]

59. Have you ever recycled, or tried to recycle, any of your agricultural plastics – other than crop chemical containers?

Yes
No

[IF YES IN Q.59 OR IF "SENT FOR RECYCLING" SELECTED IN Q.39, Q.41, Q.43, Q.45, Q.47, Q.49, Q.51, CONTINUE – OTHERWISE SKIP TO Q.61]

60. What, if anything, were the main things that motivated you to recycle or try to recycle your agricultural plastics – other than crop chemical containers?

[VERBATIM RESPONSE]

[IF NO IN Q.59, CONTINUE – OTHERWISE SKIP TO "CLOSE"]

61. What key things, if anything, would encourage you to consider recycling your agricultural plastics – other than crop chemical containers? (DO NOT READ LIST) (ACCEPT MULTIPLE RESPONSES)

On-farm pick-up service
More recycling/collection facilities
Ease cleaning requirements
Ease amount/tonnage requirements
Financial incentives
Financial dis-incentives (fees for not recycling, levies.....)
Knowledge/Information/Extension/Education
Value of ag-plastic – is it actually worth anything?
Nothing
Other, (Specify)

62. In kilometers approximately how far would you be willing to travel to get to a facility that accepts agricultural plastics for recycling – that is, agricultural plastics other than crop chemical containers?

[NUMERIC RESPONSE. RANGE: 0 TO 999.] kilometers

[CLOSE] That concludes our interview. Thank you very much for your time and input!