



Agricultural Waste Market Research Study for New York State

Part One

**Survey of County Representatives on
LDPE Agricultural Plastic Film Management**

PREPARED FOR:

**Cornell Cooperative Extension
Cornell Waste Management**

IN COOPERATION WITH:

**Black River-St. Lawrence Resource Conservation & Development -
Agricultural Recycling Committee
and
NYS Department of Environmental Conservation**

PREPARED BY:

**CANADIAN-US BUSINESS CONSULTING SERVICE
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MAY 14, 1996

Acknowledgments

This report was researched and written by the Canadian-U.S. Business Consulting Service at Clarkson University. Contributions were made by the following individuals:

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May 14, 1996

Dear Reader,

As a Cornell Cooperative Extension Educator from an involved major agricultural area of New York State and as an investigator in this issue of agricultural plastic film wastes, I am pleased to introduce the findings of this project and account for at least some of its creation. Intended to be applied cooperatively by those in best positions to address this issue, the project grew from team effort in Northern New York and from around the state. Such contributions of support well demonstrated benefits of networking toward common goals and it is hoped by this project's team that others will soon find ways together to apply our determinations. By such cooperation, we can all help affect improvements for our agricultural industry and our environment.

Much credit must be given the Canadian-U.S. Business Consulting Service based at Clarkson University for working in a highly professional matter for the project. The Service's staff honed project concepts and its consultants worked diligently over many months to conduct this assessment of agricultural plastic film waste. Their results stem from a high dedication to quality.

Cornell Waste Management Institute recognized the growing significance of this issue in the state over recent years and invested quality work on a broad scale to begin seeking improvement. As part of Cornell University's Center for the Environment, the Institute provided grant support to do the project along with crucial involvement of Extension Associate Jean Bonhotel. This made the project possible.

Northern New York's Black River-St. Lawrence Resource Conservation and Development Regional Project Office continues to provide a model role of integrating and organizing various stakeholder interests through its Agricultural Recycling Committee. Based on its early survey measures that identified this particular waste problem, R.C. and D. has successfully brought industry, agriculture and agencies together to get things done about it. R. C. and D. Coordinator Peter Spadora has well shown how synergy can be developed to get results, when nowadays it's often difficult for single stakeholders to achieve as much individually. The above committee plans already to be a leading user of this project's results.

Region Six N.Y.S. D.E.C. Environmental Program Specialist Lawrence Ambeau joined the effort early on through R.C. and D. and provided important oversight. Although D.E.C. presently does not regulate Agricultural solid waste management, such staff support shows that if the environment can best be served by education and problem-solving to find more environmentally-sound solutions for these plastic wastes, they support this projects type of process.

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Cornell Cooperative Extension in Sullivan County, Agricultural Agent Colleen McKeon added an insight into the economics related to farmers' use of plastic films to store forage. Some of the financial factors she identifies lead to implications for trends in the use of the plastic around the state. Others will likely find ways to apply her comparisons and conclusions to the farm financial dynamics directly tied to generating plastic wastes.

The Cornell Cooperative Extension Association of St. Lawrence County exemplified local Extension support for such projects even though the work involved was for the benefit of more areas in the state than just one county. Association volunteers from the St. Lawrence farm community clearly voted to proceed, recognizing the value such research could return locally, and for others.

Those above are still only part of the background to the project; there are many others to recognize for their contributing roles but space precludes a listing here. It's important to emphasize that cooperative efforts by others can develop applications out of this project; much like the way it was created. It works.

Now it's up to us all to work on ways to use the findings to make improvements, especially through education. The team above especially invites you to contact us about joining this effort.

Sincerely,

A handwritten signature in cursive script that reads 'Stephen F. VanderMark'.

Stephen F. VanderMark
Cooperative Extension Agent

amr

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EXECUTIVE SUMMARY

This report was commissioned by Cornell Cooperative Extension of St. Lawrence County, in conjunction with Cornell Waste Management Institute, NYS Department of Environmental Conservation and Black River-St. Lawrence RC&D to assess the use and disposal of LDPE agricultural plastic film in the state of New York.

The objectives of the report were to: identify current options available to farmers and all barriers to the management of the LDPE agricultural plastic film; investigate any and all barriers to the management of LDPE agricultural plastic film in every county in New York State; organize counties into "clusters" based on similar characteristics in order to correlate feasible solutions and needs; and to summarize the finding and major issues to be addressed.

Primary research consisted of administering a questionnaire via telephone targeted at recycling coordinators or individuals managing agricultural plastics for all counties in New York State. An in-depth, open ended qualitative survey was designed to elicit opinions, feedback on current and possible waste management solutions, concerns for conventional and possible alternatives, and the ability and willingness to participate in the management process of LDPE agricultural plastic film.

Research concluded that currently there are no collection programs strictly for LDPE agricultural plastic film in New York State, therefore, most of this material enters management facilities as part of the waste stream.

There may be a need for more used LDPE agricultural plastic film to stay within the recycling "loop." The LDPE agricultural plastic film "loop" refers to the movement of the material from the manufacturers to the dealers, farmers, and county recycling/solid waste facilities.

Proper management of LDPE agricultural plastic film will involve a coordinated effort between the manufacturers, dealers, farmers, and county recycling/solid waste facilities. Breakdowns in the recycling loop occur when the LDPE agricultural plastic film does not complete the cycle. Breakdowns can occur within the recycling loop as a result of disposal on the farm; county-controlled landfilling and/or incineration; or use into other LDPE end markets.

It was found that farmers play a critical role in the LDPE management process because much of the contamination takes place on the farm. With proper use and storage of this material, contamination levels can be significantly reduced, thus easing recycling and managing efforts.

The research conducted also uncovered the barriers to proper management of LDPE agricultural plastic film. They include: lack of collection procedures, ridding of contaminants, lack of convenient options for farmers, improper storage, lack of educational programs, lack of cost effective transportation, and lack of end markets.

The most popular recommendations by all 43 county respondents for encouraging management of LDPE agricultural plastic film involved: finding an end-market; increasing levels of education; developing an economic incentive for farmers; creating convenient options for farmers in managing this material; and closing the LDPE recycling loop.

As more end markets are found, collection costs may fall and the transportation of recovered material may become more cost-effective for everyone involved in the recycling loop.

Clusters of counties in New York state were formed based on the similarity of production levels of milk, hay, and corn. It was found that certain clusters had higher levels of knowledge and awareness of the issues involving LDPE agricultural plastic film than other clusters.

The North County cluster has the highest awareness of LDPE agricultural plastic film and perceived that improper storage is a significant barrier because of the greater volume of LDPE agricultural plastic film brought into their facilities relative to other clusters.

The Genesee Valley cluster only has landfilling capabilities for the management of LDPE agricultural plastic film and stated expansion of education on the management process was the most important place to start.

The Western cluster had attempted to run pilot programs to better manage LDPE agricultural plastic film, although no successful end-market was found. In addition, the western cluster charges a lower tipping fee relative to the other clusters, thus encouraging farmers to better manage their plastic through county facilities.

The Central cluster conducted a study to find an end-market for LDPE agricultural plastic film. However, because of the stringent requirements, a sufficient end-market could not be found.

It was found that because the barriers to the effective management of LDPE agricultural plastic film are closely related on one another, addressing one barrier may alleviate another. For example, having an efficient management process that creates a demand for the used plastic would assist in developing an end market.

Moreover, the advantages of the LDPE agricultural plastic film recycling loop may be lower costs and a secure end market. With a guaranteed end market, many of the barriers such as a lack of collection procedures, cost-effective transportation, and the obvious lack

of an end market may be overcome. It was concluded that the management of LDPE agricultural plastic film needs to be a cooperative effort among all participants in the management process.

Furthermore, education can be facilitated through Cornell Cooperative Extension, Cornell Waste Management Institute, NYS Department of Environmental Conservation, Black River-St. Lawrence RC&D, and other agricultural supportive agencies. However, they cannot be solely responsible for this education, because all participants in the management process should be involved.

It was also concluded that changes in the management process may require the support of state and local government since most current regulations allow farmers to dispose of waste on their own property. Therefore, incentives are needed to encourage farmers to retain used agricultural plastics rather than dispose of them on the farm. Finally, it was concluded that a deposit/refund system could be developed to encourage farmers to return their LDPE agricultural plastic film to a recovery site.

Nonetheless, the most effective management process for LDPE agricultural plastic film depends on many factors, such as amount used in the county or region, ability to manage it in each community, and the geographic and economic conditions specific to each county or cluster of counties. If counties are interested in collecting LDPE agricultural plastic film to better manage it, education of users will be the key.

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1.0 INTRODUCTION

Mr. Steve VanderMark, Extension Associate for the Cornell Cooperative Extension of St. Lawrence County, Jean Bonhotal for the Cornell Waste Management Institute, Larry Ambeau of the NYS Department of Environmental Conservation, and Peter Spadora of the Black River-St. Lawrence RC&D approached the Canadian-U.S. Business Consulting Service requesting an assessment of the use and disposal of agricultural plastics in New York State. This project was focused primarily on the county recycling coordinators in the state of New York, in order to more accurately define the level of knowledge and current means of management within the counties.

2.0 OBJECTIVES

The agricultural waste market research study was conducted in order to achieve the following objectives:

- to identify current options available to farmers in New York State for managing used LPDE agricultural plastic film,
- to investigate any and all barriers to the best managing of LPDE agricultural plastic film in each county in New York State,
- to organize counties into "clusters" based on similar characteristics in order to correlate feasible solutions with needs and,
- to summarize findings and develop a comprehensive recommendation plan.

3.0 METHODOLOGY

The information obtained in this report was gathered through both primary and secondary research in order to assist extension associates and waste management agencies in agricultural communities across the state and establish effective local policies and procedures on managing agricultural plastic waste. The Canadian-U.S. Business Consulting Service worked under the guidance of Mr. VanderMark and Ms. Jean Bonhotal, the DEC, and the Agricultural Recycling Committee of the Black River-St. Lawrence RC&D to ensure that our secondary research efforts did not overlap existing data and to help consultants establish contacts with experts in the field. Dr. Fredric Menz, professor of economics, who specializes in environmental issues, provided necessary information and insight throughout the development of the project.

Primary Research

Primary research consisted of administering a survey (Appendix A) via telephone aimed at recycling coordinators or individuals who managed agricultural plastics for all of the counties in New York State.

An in-depth, open ended, and qualitative survey was developed to structure the discussion between the interviewer and respondent. Questions were designed to elicit options and feedback on current and possible waste management solutions, concerns for conventional and possible alternatives, and the ability and willingness to participate in management programs. Information provided insight into concerns and interests associated with the issue and provided the basis for the final recommendations. Interviewers were trained to probe respondents for in-depth explanations as to the current procedures and attitudes in the respondent's area.

From the initial contact list provided by Cornell Cooperative Extension, Cornell Waste Management, and NYS Department of Environmental Conservation, prospective respondents were screened to determine if they were responsible for the management of LDPE plastic film. An appointment was made to survey the county representative at their convenience and the surveys were completed over the telephone by the consultants on the project.

The survey was divided into three sections: general management practices, specific process practices, and demographics (Appendix B: County Demographic Information). These sections were designed to flow in a logical manner allowing the respondent to communicate their personal and professional knowledge.

The first question filtered out respondents that did not manage LDPE agricultural plastic film or were not knowledgeable of LDPE agricultural plastic film. Of the counties, municipalities, and townships contacted, forty-three county representatives completed the survey (Appendix C: Survey Respondents).

The clusters were formed based on the similarity of characteristics among different counties. The primary characteristics considered were production levels of milk, hay, and corn. Counties with similar total production levels were placed in their respective cluster. Cluster names were chosen based on their geographic location within New York State: North Country, Genesee Valley, Western, Central, and Catskill.

Secondary Research

Secondary resources (Appendix D) were used to identify and assess the current use and management of agricultural plastics throughout the United States and Canada. The steps toward assessing the management of agricultural plastics were to:

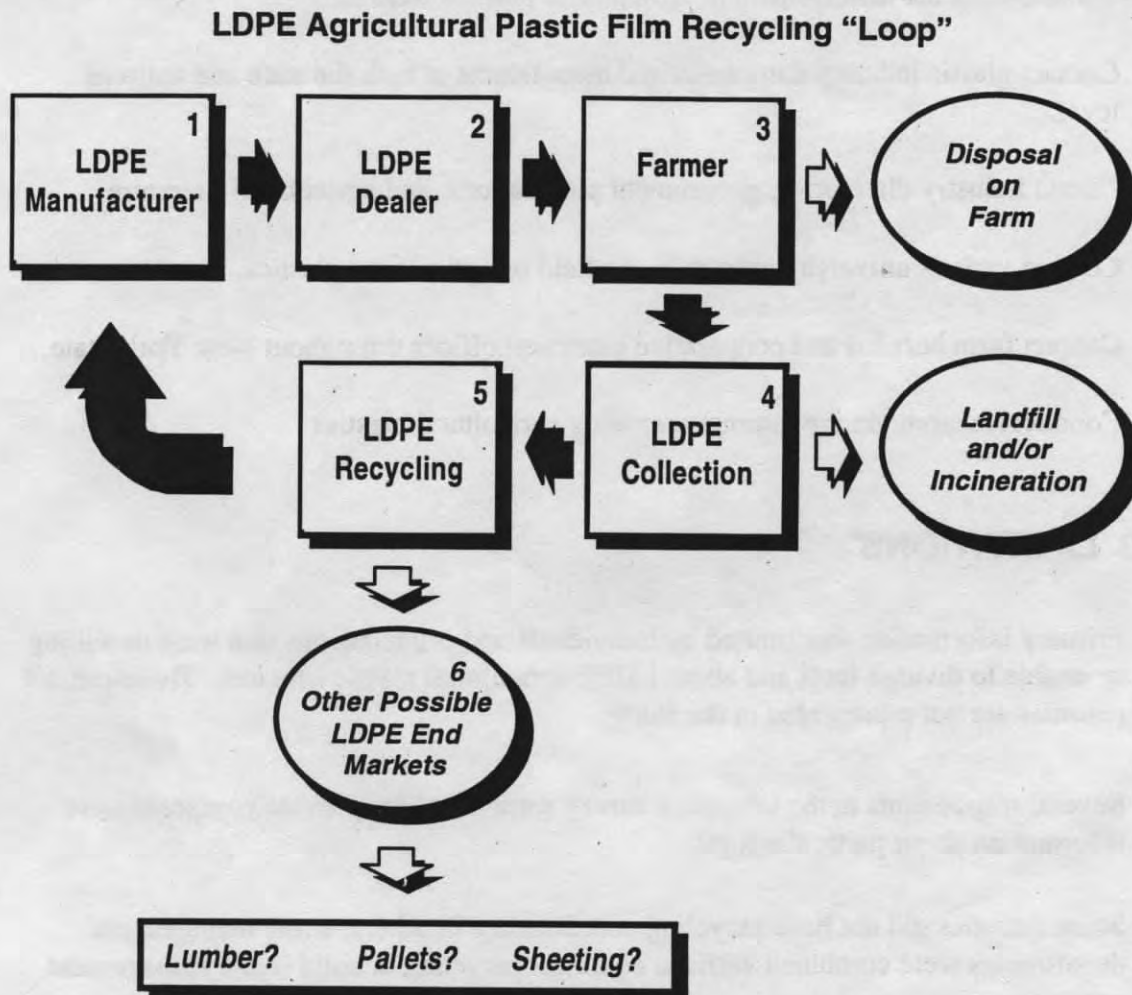
- Contact plastic industry companies and associations at both the state and national level.
- Obtain industry directories, government publications, and agricultural literature.
- Contact various university experts in the field of agricultural plastics.
- Contact farm bureaus and cooperative extension offices throughout New York State.
- Conduct research via the Internet regarding agricultural plastics.

4.0 LIMITATIONS

- Primary information was limited by individuals and organizations that were unwilling or unable to divulge facts and about LDPE agricultural plastic film use. Therefore, all counties are not represented in the study.
- Several respondents to the telephone survey were unable to provide comprehensive information about particular topics.
- Some counties did not have recycling coordinators; in others, waste management departments were combined with the counties' recycling or solid waste management programs.
- The scope of the report was limited because there was no opportunity to speak with farmers. In addition, the county representatives' interpretation of the survey questions may differ, thus varying answers from one respondent to the other.
- Subsequent to executing the surveys and tabulating the results, it was found that answers to some questions were repetitive. Therefore, some survey questions and responses were combined for clarity purposes in the primary research analysis section of the report.

5.0 TERMINOLOGY

The following schematic illustrates the terminology and concepts used throughout the report:



The LDPE agricultural plastic film "loop" refers to the movement of the material from the manufacturer (box 1) through to the LDPE recycler (box 5) and back to the manufacturer (box 1).

Breakdowns in the recycling loop occur when the LDPE agricultural plastic film does not complete the cycle. Breakdowns can occur within the recycling loop as a result of:

- disposal on farm,
- county-controlled landfilling and/or incineration, or
- use into other LDPE end markets.

5.1 Disposal on Farm

The first breakdown in the recycling loop occurs if the farmer disposes of LDPE agricultural plastic film on site by either burning or burying the material. This may limit the amount of LDPE agricultural plastic film that is collected (box 4) to be either landfilled or incinerated through the county-controlled process or recycled.

5.2 County-controlled Landfilling and/or Incineration

The second breakdown in the recycling loop occurs when the LDPE agricultural plastic film is landfilled and/or incinerated through a county-controlled facility. This may again limit the amount of LDPE agricultural plastic film that can be recycled.

5.3 Other LDPE End Markets

The third breakdown in the recycling loop occurs if the LDPE agricultural plastic film is not returned to the manufacturer (box 1) and is used in non-agricultural end markets, such as lumber, pallets, and sheeting.

5.4 LDPE Agricultural Plastic Film Management Methods

LDPE agricultural plastic film can be managed through:

- On-site incineration (on the farm)
- On-site landfilling (on the farm)
- County-controlled landfilling
- County-controlled incineration
- County-controlled recycling

5.5 Tipping Fee

A tipping fee is a monetary charge for the service of managing solid waste or recyclable materials. The tipping fee is paid by the farmer or hauler to the management facility.

6.0 PRIMARY RESEARCH

6.1 New York State

Recycling coordinators and waste disposal managers representing forty-three New York State Counties were surveyed to determine management practices for LDPE agricultural plastic film within each county. The chart below represents the 43 counties participants (Appendix C):

County	Position Surveyed	Name of Organization
Allegany	Recycling Coordinator	Department of Public Works
Broome	Materials Recovery Manager	Broome County Division of Solid Waste
Cattaraugus	Recycling Coordinator	Cattaraugus County Department of Public Works
Cayuga	Program Administrator	Solid Waste Management Program
Chautauqua	Recycling Coordinator	Division of Solid Waste
Chemung	General Manager	Solid Waste Management District
Chenango	Recycling Coordinator/Waste Station Operator	Chenango County Recycling Center
Clinton	Recycling Coordinator	Clinton County Recycling Center
Cortland	Recycling Coordinator	Cortland County Recycling Center
Delaware	Solid Waste Coordinator	Department of Solid Waste
Dutchess	Recycling Coordinator	Dutchess County Recycling Center
Erie	Environmental Agricultural Specialist	Department of Environment and Planning
Essex	Recycling Coordinator	Serkil, Limited Liability Company
Franklin	Recycling Coordinator/ Solid Waste Director	Franklin County Solid Waste Facility
Fulton	Recycling Coordinator	Fulton County Recycling Center
Genesee	Recycling Coordinator	GLOW Regional Solid Waste
Herkimer	Director of Recycling	Oneida / Herkimer Recycling Center
Jefferson	Director of Solid Waste	Department of Public Works
Lewis	Solid Waste Supervisor	Lewis County Solid Waste and Recycling
Livingston	Recycling Coordinator	GLOW Regional Solid Waste
Montgomery	Executive Director	MOSA Solid Waste Management Authority
Monroe	Environmental Facility Coordinator	Department of Environmental Services
Oneida	Director of Recycling	Oneida / Herkimer Recycling Center
Onondaga	Recycling Coordinator Public Information Officer	Onondaga County Resource Recovery System
Ontario	Director of Solid Waste Management	Ontario County Department of Solid Waste
Orleans	Recycling Coordinator	GLOW Regional Solid Waste
Otsego	Executive Director	MOSA Solid Waste Management Authority
Saratoga	Recycling Coordinator	Department of Public Works
Schoharie	Executive Director	MOSA Solid Waste Management Authority
Schuyler	Cornell Cooperative Agent/Recycling Coordinator	Schuyler County Recycling Program
Seneca	Public Relations and Education Coordinator	Western Finger Lakes Solid Waste Authority
St. Lawrence	Recycling Coordinator/ Compliance Officer	St. Lawrence Solid Waste Authority
Steuben	Recycling Coordinator	Department of Public Works Solid Waste Division
Sullivan	Recycling Coordinator	Sullivan County Division of Solid Waste
Tompkins	Recycling Coordinator	Tompkins County Solid Waste
Tioga	Solid Waste Manager	Tioga County Solid Waste Division
Ulster	Recycling Coordinator	Ulster County Resource Recovery
Warren	Plant Manager	Warren County Recycling Center
Washington	Recycling Coordinator	Washington Department of Public Works
Wayne	Public Relations and Education Coordinator	Western Finger Lakes Solid Waste Authority
Westchester	Program Administrator of Resource Management	Department of Environmental Facilities
Wyoming	Recycling Coordinator	GLOW Regional Solid Waste
Yates	Public Relations and Education Coordinator	Western Finger Lakes Solid Waste Authority

Eleven counties representing the New York City metropolitan area were excluded because of limited use and minimal knowledge of LDPE agricultural plastic film. In addition, eight counties did not respond.

6.1.1 LDPE Agricultural Plastic Film Management

Question: How is LDPE agricultural plastic film currently being managed in your county?

LDPE MANAGEMENT PROCESS	NUMBER OF COUNTY RESPONDENTS n=43*
Landfill	31
Landfill and incineration	9
Incineration	3

*** NOTE: Respondents were allowed to respond to more than one answer category.**

Thirty-one counties stated that they managed LDPE agricultural plastic film through landfilling exclusively. In addition, nine of the counties managed LDPE agricultural plastic film through landfilling and incineration, while three counties used incineration as the only form of managing LDPE agricultural plastic film. According to New York State law, all facilities in the state are required to accept LDPE agricultural plastic films, although recycling the material is not mandated. Landfilling offers the county an inexpensive and convenient method of managing solid waste. In addition, landfill space is the most available. Therefore, it has become the most widely used management process for LDPE agricultural plastic film.

6.1.2 Collection or Management by Other Entities

Question: Are you aware of any LDPE collection or management by any other entities?

COLLECTION OR MANAGEMENT BY OTHER ENTITY	NUMBER OF COUNTY RESPONDENTS n=43
Farm disposal	39
Private haulers	27
Dealers	3
Other	20

* NOTE: Respondents were allowed to respond to more than one answer category.

Thirty-nine counties stated that LDPE agricultural plastic film was managed on the farm through on-site landfilling and/or incineration. This high level of on-site farm disposal may be attributed to either lack of education about adverse effects of this type of management or the lack of incentives to use other forms of management. Twenty-seven counties used or were aware of private haulers to collect LDPE agricultural plastic film. However, the collection process does not include LDPE agricultural plastic film exclusively, since most of the material is collected as part of the general waste stream. All respondents stated there was much more LDPE agricultural plastic film being used in their area than the amount entering their facility. Nonetheless, none of the counties were able to specify the quantity of LDPE agricultural plastic film being used in their county. Other responses included: privately-owned landfills, privately-owned incinerators, out of state landfills or incinerators, and out-of-county landfills or incinerators.

6.1.3 Tipping Fee

Question: What is the tipping fee for landfilling, incineration, and/or recyclable materials?

LDPE MANAGEMENT PROCESS	AVERAGE TIPPING FEE
Landfilling	\$57*
Incineration	\$53*
Recyclable materials	\$43*

* Average tipping fees for all facilities that charge.

Tipping fees effect the quantity of LDPE agricultural plastic film recovered by county authorities. For example, in table 6.1.2, 39 of the 43 counties were aware of on-site farm disposal. Therefore, tipping fees may inhibit the farmers' willingness to utilize the landfill or incineration facilities available through the county.

6.1.4 Collection Process of LDPE Agricultural Plastic Film

Question: Do you collect LDPE agricultural plastic film or is it brought to your facilities?

All counties stated that there was no collection process in place specifically for LDPE agricultural plastic film. However, all counties stated that LDPE agricultural plastic film was part of the waste stream or brought into their facilities. Because LDPE agricultural plastic film is not considered recyclable by New York state law, there is no incentive for private or public haulers to collect the material separately.

6.1.5 Physical State of the LDPE Plastic Film Entering the Facility

Question: In what physical state does the plastic enter your facility?

STATE OF PLASTIC ENTERING FACILITIES	NUMBER OF COUNTY RESPONDENTS n=43*
Contaminated	35
Loose	28
Cleaned	2
Baled	1
Not aware	4

* NOTE: Respondents were allowed to respond to more than one answer category.

Thirty-five counties stated that LDPE agricultural plastic film enters their facility in a contaminated state. In 28 counties, the material enters the facility in a loose state. In both cases, the county faces difficulties in recycling the material.

6.1.6 Difficulties in Managing LDPE Agricultural Plastic Film

Question: Are there any difficulties in managing the film that currently enters your facility?

DIFFICULTIES IN MANAGING LDPE	NUMBER OF COUNTY RESPONDENTS n=43
Yes	6
No	24
Not aware	13

Twenty-four of 43 counties stated that they had no difficulty in managing LDPE agricultural plastic film and another 13 stated they were not aware of particular difficulties in managing LDPE agricultural plastic film. None of the counties surveyed separated LDPE agricultural plastic film from the waste stream, so it was difficult to determine particular management problems with this material. For counties that experienced difficulties using incineration, the problem was in achieving the correct proportion of LDPE agricultural plastic film to other waste. According to Erie and Onondaga counties, proper LDPE agricultural plastic film incineration requires a specific combination of LDPE and other solid waste to achieve optimal burning temperature levels. Chenango and Ulster counties stated their most significant challenge when landfilling was that wind made the material difficult to manage.

6.1.7 Tons of LDPE Managed in a Given Year

Question: How many tons of LDPE agricultural plastic film is managed by your facility in a given year?

TONS OF LDPE MANAGED PER YEAR	NUMBER OF COUNTY RESPONDENTS n=43
Aware	12
Not aware	31

Thirty-one counties were not aware of how much LDPE agricultural plastic film was managed in a given year. The remainder were unable to provide accurate measurements.

6.1.8 Barriers to the LDPE Agricultural Plastic Film Management Process

Question: What barriers do you think affect the entire LDPE plastic management process?

BARRIERS TO THE MANAGEMENT OF LDPE	NUMBER OF COUNTY RESPONDENTS n=43*
Contaminated LDPE	23
Lack of collection procedures	21
Lack of end-markets	20
Lack of convenient options for farmers	17
Lack of educational programs	15
Improper storage	12
Lack of cost effective transportation	11
Other	16
Not aware	1

* NOTE: Respondents were allowed to respond to more than one answer category.

Twenty-three of 43 county representatives stated that contaminated LDPE was the most significant barrier to the recycling of LDPE agricultural plastic film, while 21 counties stated the lack of collection was the most significant barrier. Because a wide range of barriers to managing LDPE agricultural plastic film were identified, eliminating a single barrier may not have a significant impact on the improvement of the recycling. On the other hand, because some barriers are interdependent, eliminating one barrier may assist in alleviating others. For example, by developing a cost-effective cleaning process, the end-market demand for LDPE may increase.

6.1.9 Constraints on Capacity and/or Storage

Question: Are there any constraints on your current capacity and/or storage?

All counties with baling machines stated that their machines had excess capacity. Therefore, the processing of LDPE agricultural plastic film may be possible in the future at little incremental cost.

Although LDPE agricultural plastic film is not currently separated from the waste stream, it is perceived (by county representatives) that their facilities would have storage difficulties before processing because of the low incoming volume and the low LDPE turnover. County representatives also stated they may have difficulty in determining storage constraints after processing because of the sporadic arrival of LDPE agricultural plastic film.

6.1.10 Adaptation Needed for Current Facilities to Better Manage LDPE

Question: What would be needed to adapt the local facility to better manage LDPE plastic film?

ADAPTATIONS NEEDED TO BETTER MANAGE LDPE	NUMBER OF COUNTY RESPONDENTS n=43*
Equipment	13
Labor	9
Storage	8
Cost	2
Other	1
Not aware	25

* NOTE: Respondents were allowed to respond to more than one answer category.

Thirteen county representatives stated that equipment was needed to adapt their facilities in order to more effectively manage LDPE agricultural plastic film. Nine of the counties believed that additional labor would be necessary in order to adapt their facilities. Twenty-five county representatives were unaware of adaptations needed for their facility to better manage LDPE agricultural plastic film. Moreover, county representatives stated that their facilities were currently capable of managing LDPE agricultural plastic film.

6.1.11 Government Requirements for Management of LDPE

Question: Are there any government requirements at the local, county, or state level for management of the LDPE plastic film?

LDPE agricultural plastic film is not considered a recyclable material by law. In order for any material to be considered recyclable, its processing costs must be at or below the end market price for the processed material. Only one county representative (Oneida-Herkimer) indicated that there was a local government requirement for the management of LDPE agricultural plastic film. The local regulation bans open burning or the burying of solid waste or recyclable materials on private property. The two counties are included in the North Country cluster.

6.1.12 Recommendations to Encourage Management of LDPE

Question: Do you have any recommendations that would help encourage management of LDPE plastic film?

RECOMMENDATIONS TO ENCOURAGE MANAGEMENT OF LDPE	NUMBER OF COUNTY RESPONDENTS n=43*
Find an end-market	16
Increase education	13
Economic incentive for farmer	13
Convenience for farmers	12
Close the LDPE recycling loop	12
Regulations	4
Government subsidies	3
Regional collection to increase volume	3
Lower tipping fee	1
Not aware	6

*** NOTE:** Respondents were allowed to respond to more than one answer category.

The top recommendation by 16 recycling coordinators and solid waste managers was to find an end market for recycled LDPE agricultural plastic film. The next three recommendations focused on the farmer and concerned education, incentives, and convenience. Thirteen county representatives recommended that education be focused on management options available through the county such as landfilling and incineration, reuse of the material, and the consequences of on-site disposal. Economic incentives were recommended by 13 counties in order to gain more cooperation and participation by the farmers. Twelve respondents recommended a more convenient county-controlled method of collecting LDPE agricultural plastic film, in order to gain farmers' support.

Twelve counties mentioned the need for the recycling loop to be closed. The need for the recycling loop to be closed is represented by a cooperative effort by the manufacturer, dealer, farmer, and management facility in which the LDPE agricultural plastic film is processed into products for agricultural use. The success of a recycling coordinator or a solid waste manager depends on the volume of recyclables recovered. Therefore, if farmers are restricted to county-controlled management options, and if end markets are created, the volume of recyclables may increase. However, six respondents were not aware of any recommendations to encourage management of LDPE agricultural plastic film.

6.1.13 Knowledge of Pilot Programs in the Field of LDPE Plastics

Question: Are you aware of pilot programs or studies in this field?

AWARE OF STUDIES/ PILOT PROGRAMS	NUMBER OF COUNTY RESPONDENTS n=43
Yes	16
No	27

Twenty-seven respondents were not aware of studies and/or pilot programs concerning LDPE agricultural plastic film. If sufficient education programs are currently in place, it is not being communicated adequately to the manufacturer, dealer, farmer, recycling coordinators, and/or other recyclers. It was perceived that once the plastic becomes more of a visible problem, more studies and pilot programs will be initiated.

7.0 COUNTY CLUSTER SUMMARY

7.1 North Country Cluster

The counties in this cluster include: Clinton, Essex, Franklin, Fulton, Hamilton, Herkimer, Jefferson, Lewis, Oneida, Saratoga, St. Lawrence, Washington, and Warren. Herkimer and Oneida counties are managed by one facility. Hamilton County is not represented within the sample since there is not a significant number of farms within this county.

- Lewis County stated that LDPE agricultural film plastic was brought in by the farmers and separated from other waste. After baling the plastic, it is transferred to Richard Vancour, an Ag-Bag Dealer in Evans Mills, New York.
- All respondents indicated that on-site disposal of LDPE agricultural plastic film is a serious concern in the North Country.
- The North Country cluster has the highest awareness of LDPE agricultural plastic film among the six clusters in New York state.
- Improper storage is perceived as a significant barrier because of the greater volume of LDPE agricultural plastic film brought into the facilities relative to other clusters.
- Of all the clusters, the North Country was the only one to recommend government subsidies as a way to encourage the management process of LDPE agricultural plastic film.

7.2 Genesee Valley Cluster

The counties included in this cluster are: Broome, Chemung, Monroe, Ontario, Schuyler, Seneca, Tioga, Tompkins, Wayne, and Yates. The Western Finger Lakes Solid Waste Authority includes Wayne, Yates, and Seneca Counties.

- All counties within this cluster only have the option of landfilling available for management of LDPE agricultural plastic.
- Wayne, Yates, Seneca, Monroe, Tompkins, and Broome Counties utilize private landfill options available through Seneca Meadows and/or High Acres landfills. Broome County also uses landfills in Pennsylvania.
- Currently, efforts are being made to expand education to include not only consumers but also private haulers.

- This cluster's top recommendation for encouraging management of LDPE agricultural plastic film was to increase education. Out of the thirteen counties that recommended increased education, seven were from the Genesee Valley cluster.

7.3 Western Cluster

The counties included in this cluster are: Allegany, Cattaraugus, Chautauqua, Erie, Genesee, Livingston, Niagara, Orleans, Steuben, and Wyoming. Genesee, Livingston, Orleans, and Wyoming are included in GLOW. Niagara county did not participate.

- While the majority of New York state counties (31 of 43) landfill exclusively, the Western cluster manages LDPE agricultural plastic film through both incineration and landfill.
- The abundance of landfills and waste-to-energy facilities has led to a lower tipping fee relative to other New York state counties. This lower tipping fee has encouraged farmers to better manage their plastic through county facilities.
- Pilot programs have been attempted for recycling LDPE agricultural plastic film, however no program has ever been established because of the changing demands of the end market used in the pilot programs.
- County representatives in this cluster observed that money allocated towards education programs have steadily decreased over the years. This may be because of the perception that education about waste management has been completed and is no longer necessary.

7.4 Central Cluster

The counties included in this cluster are: Albany, Cayuga, Chenango, Cortland, Madison, Onondaga, Oswego, Otsego, Schenectady, Schoharie. MOSA Solid Waste Authority includes Montgomery, Otsego, and Schoharie counties. Albany and Madison did not participate.

- In the Central cluster, a study was conducted to find an end market for LDPE agricultural plastic film. However, because of the stringent requirements set by the counties' recycling handler, Resource Recovery Systems, a sufficient end market could not be found.

7.5 Catskill Cluster

The counties included in this cluster are: Columbia, Delaware, Dutchess, Greene, Orange, Sullivan, and Ulster. Orange, Greene, and Columbia Counties were not familiar with LPDE agricultural plastic and therefore, did not participate in the study.

- There were no significant deviations from respondents in this cluster compared to New York state (Section 5.0).

8.0 CONCLUSIONS

The usage of LDPE agricultural plastic film is growing on farms throughout the United States and Canada. Although LDPE agricultural plastic film represents a small section of the overall waste stream, it is important to address the problem while it is still manageable. Awareness of waste problems associated with LDPE agricultural plastic film are low, both in New York State and throughout the country. However, pilot programs and research studies are being conducted. If more of the used LDPE agricultural plastic film can be recovered and more end-market uses identified, recycling will become more cost effective.

Within New York State, on-site landfilling and burning is prevalent. Only Lewis County has a program specifically for the management of LDPE agricultural plastic film, but farmer participation levels in this program are low. There are no collection programs strictly for LDPE agricultural plastic film in the state, so most of this material enters management facilities as part of the waste stream. Before key issues can be addressed, it is important to examine the problems associated with proper recovery of LDPE agricultural plastic film.

8.1 Barriers

There are barriers to the effective management of LDPE agricultural plastic film. Some are closely related to one another, so addressing one barrier may alleviate another. For example, having an efficient management process that creates a demand for the used plastic would help in developing an end market. Barriers to recovering LDPE agricultural plastic film concern collection, contaminants, alternative disposal methods, storage, educational programs, transportation, and end markets.

8.1.1 Lack of Collection Procedures

Collection refers to the process of removing the LDPE agricultural plastic film from the farm. This process must be convenient for farmers since many do not have the time to transport used LDPE agricultural plastic film to the collection facility or the time required for preparing the material for processing. Preparation activities may include washing, bundling, and uniform slicing. In addition, the process must be free of monetary costs to the farmer because there exists little margin for imposing fees on farmers for agricultural plastics management. This creates a situation where the solid waste facility may bear the majority of the responsibility for collecting used LDPE agricultural plastic film. The facility may incur a substantial expense to implement and maintain a collection process while obtaining the cooperation of the farmer.

8.1.2 Contaminants

The contamination of used LDPE agricultural plastic film presents another barrier to recovery and recycling. The plastic contains a high level of contamination from ultraviolet damage, dirt, mud, hay, silage, and pesticides. Ultraviolet damage decreases the strength of the plastic, thus rendering the plastic unsalvageable. Dirt, mud, hay, and silage increase the costs associated with management processing. Washing the plastic may produce an unwanted by-product (contaminated water). Pesticide contamination presents two different types of problems: the recycler may perceive the plastic as being contaminated although pesticides may not be present, and therefore, may refuse to accept the material. The other problem is the lack of cost-effective technology to wash plastics that are contaminated with pesticides. There is currently research being conducted to analyze the actual levels of contamination, and the harmfulness of the remnants of pesticides on the plastic. Results should be available in Summer 1996.

8.1.3 Lack of Options for Farmers

Currently, it is more cost effective for the farmer to dispose of the plastic on-site through landfilling or burning. In order to discourage these practices, solid waste coordinators suggest that regulations be established. Further, waste management alternatives need to be proven as a cost-effective method of disposal for the farmer. If the alternative to waste disposal on the farm involves paying a tipping fee, there will be less incentive for farmers to properly dispose of used LDPE agricultural plastic film.

8.1.4 Storage

Storage is difficult at all stages of the loop because the LDPE agricultural plastic film is light-weight and loose. The high storage time associated with this plastic is due to the slow rate of plastic arriving at the collection facilities, therefore, limiting the efficiency of the processing machinery. When LDPE agricultural plastic film enters the facility in a loose state, additional storage costs are incurred.

8.1.5 Lack of Educational Programs

Due to budget constraints and lack of knowledge, there is little current education on the management of LDPE agricultural plastic film. Many county representatives surveyed were unaware of LDPE and the particular problems associated with its recovery.

8.1.6 Lack of Cost-effective Transportation

Transportation includes the removal of the LDPE agricultural plastic film from the farm to the collection facility and trucking from the collection facility to the end market. Transportation costs are another barrier to recycling due to the wide geographic scope of the farm locations and the low volume of LDPE agricultural plastic film. With larger volumes of LDPE agricultural plastic film, transportation and collection will become more cost effective.

8.1.7 Lack of End Markets

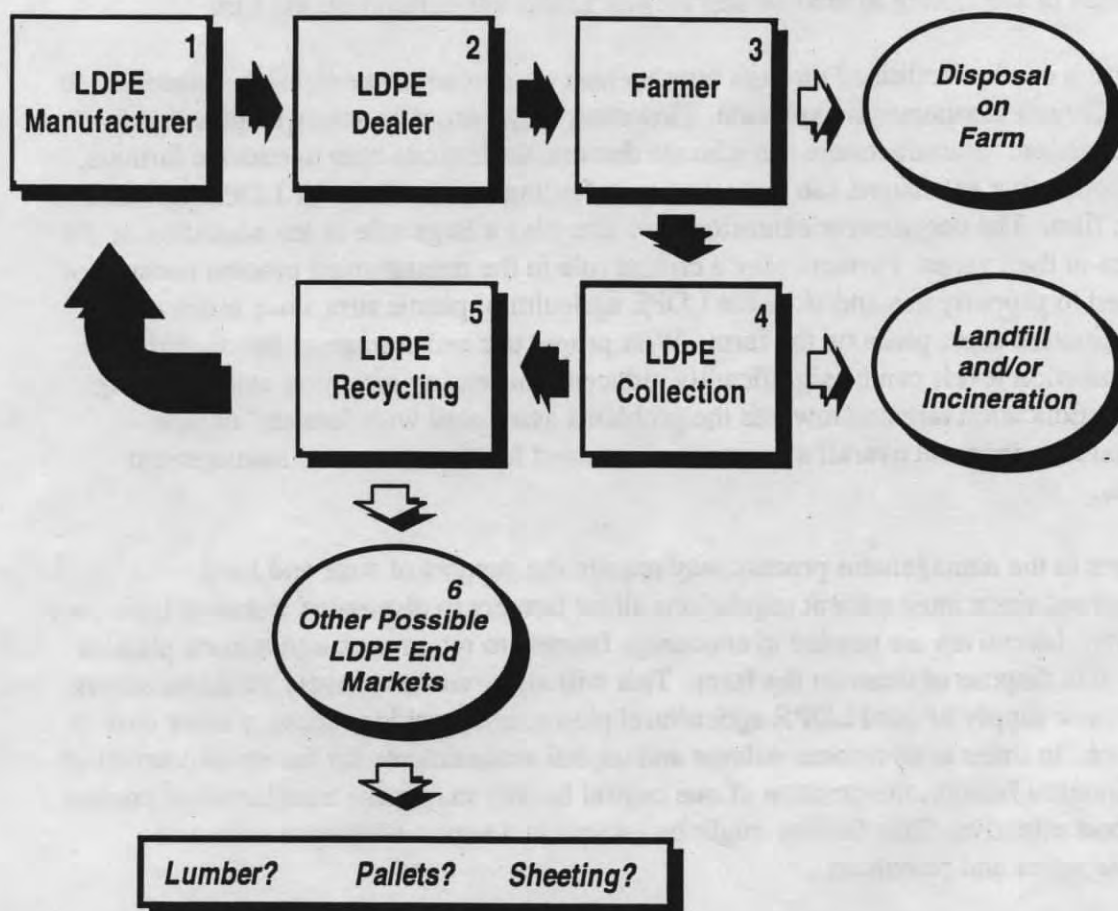
The high costs of transportation, collection, and processing currently reduces the end-market demand for recycled LDPE agricultural plastic film. However, if other barriers are reduced or eliminated, costs for recycling LDPE agricultural plastic may decrease, thus creating more demand in the end-market.

8.2 Current Management Practices

Current practice throughout the state of New York is to use landfills and incinerators to process waste. The combination of collection difficulties and high tipping fees has discouraged recovery of used LDPE agricultural plastic film. Contamination levels have also been a determinant in poor reclamation programs, and in developing or finding a suitable end-market. Current regulations allow farmers to landfill waste on their property, or use burning barrels. Oneida/Herkimer County are the only counties surveyed that prohibited farmers from landfilling and burning waste on their property. Overall, management for LDPE agricultural plastic film is still in its infancy regarding education and process management.

9.0 KEY ISSUES

LDPE Agricultural Plastic Film Recycling "Loop"



There is a need for more of the used LDPE agricultural plastic to stay within the recycling loop. This would require a cooperative effort by the manufacturer, dealer, farmer, and management facility in which the LDPE agricultural plastic film is processed into products for agricultural use. The advantages of the LDPE agricultural plastic film recycling loop may be lower costs and a secure end-market. With a guaranteed end market, many of the barriers such as a lack of collection procedures, cost-effective transportation, and the obvious lack of an end market may be overcome.

The management of LDPE agricultural plastic film needs to be a cooperative effort among all participants in the management process. The participants in the management process include: manufacturers, dealers, farmers, waste recovery managers, and end-market producers. These participants need to be aware of the peculiar difficulties presented in attempting to recover and recycle LDPE agricultural plastic film.

Education can be facilitated through involvement of cooperative extension systems such as the Cornell Cooperative Extension. However, they cannot be solely responsible for this education. Manufacturers can educate dealers, dealers can help to educate farmers, and cooperative extensions can aid counties in finding end-markets for LDPE agricultural plastic film. The cooperative extension may also play a large role in the education of the farmers in their areas. Farmers play a critical role in the management process because of the need to properly use and store the LDPE agricultural plastic film since much of the contamination takes place on the farm. With proper use and storage of this material, contamination levels can be significantly reduced, thus easing recycling and managing efforts. Education targeted towards the problems associated with farmers' on-site disposal may increase overall awareness of the need for changes in the management process.

Changes in the management process may require the support of state and local government since most current regulations allow farmers to dispose of waste on their own property. Incentives are needed to encourage farmers to retain used agricultural plastics rather than dispose of them on the farm. This will allow waste recovery facilities access to a greater supply of used LDPE agricultural plastic film, making recovery more cost effective. In order to overcome volume and capital requirements for the establishment of a reclamation facility, the creation of one central facility may make a reclamation process more cost effective. This facility might be located in a region with open access to multiple states and provinces.

Finally, a deposit/refund system could be developed to encourage farmers to return their LDPE agricultural plastic film to a recovery site. The incentive rate could be based on the number of pounds purchased, thus making it possible to recover the deposit as a certain quantity is returned. Total waste disposal costs would be decreased because landfill tipping fees would be awarded.

The most effective management process for LDPE agricultural plastic film depends on many factors. The decision to emphasize a particular management process such as county-controlled incineration, landfilling, or recycling, depends on the geographic and economic conditions specific to each county or group of counties. For example, it might be more effective to landfill LDPE agricultural plastic film in an area where there is an abundance of land available.

APPENDIX A
Cornell Survey

First Contact _____ (Date)
Survey Completed _____
Follow Up _____

CORNELL SURVEY

County/Organization/Firm name _____
Contact _____
Title _____
Address _____
Phone number _____
Fax Number _____

Hello, my name is _____, I am calling from the Canadian US Consulting Service at Clarkson University. Currently we are working with Cornell Cooperative Extension and the Cornell Waste Management Institute to determine current practices being used for the disposal of agricultural plastic film. We would like to take a few minutes of your time to employ your expertise in this area.

MANAGEMENT OF LDPE PLASTIC FILM

1. How is LDPE currently being managed of in your county? (**Can answer more than one of the following**):

- WE ACCEPT AND IT IS REMOVED BY OTHER ENTITY
- BALED AND STORED
- INCINERATED
- LANDFILLED
- RECYCLE
- OTHER
- DO NOT KNOW (FIND CORRECT CONTACT)

2A. Are you aware of any LDPE collection or management by any other entities?

- DISPOSED OF AT FARM
- PRIVATE HAULERS
- DEALERS
- MANUFACTURERS
- OTHER LANDFILLS (where) _____
- OTHER INCINERATORS (where) _____
- OTHER

3. What is the tipping fee for:

- LANDFILLING _____
- INCINERATOR _____
- RECYCLABLE MATERIALS _____

4. Do you physically collect LDPE agricultural plastic or film, or is it brought to your facilities?

- COLLECT
- BROUGHT IN

5. What does your management process for LDPE include? (**More than one may apply**):

- COLLECTION
- ACCEPTANCE
- BALING
- STORAGE: AVG. LENGTH OF TIME _____
- SEPARATING FROM OTHER FORMS OF WASTE
- DISPOSAL

6. Are there any difficulties in managing the film that is currently brought to you?

7. In what physical state does the plastic enter your facility (**More than one may apply**):

- CLEANED
- CONTAMINATED
- BALED
- LOOSE

8. Does this physical state of the plastic present any difficulties?

9. How many tons of LDPE is managed by your facility in a given year? ___tons/year

10. What barriers do you think affect the entire LDPE management process?

- A. COLLECTION _____
- B. STORAGE _____
- C. RIDDING OF CONTAMINANTS _____
- D. TRANSPORTATION _____
- E. EDUCATIONAL PROGRAMS _____
- F. EASE OF ALTERNATIVES TO FARMERS _____
- G. OTHER CONSIDERATIONS _____

11. Are there any constraints on your current:

A. CAPACITY OF BALING MACHINES
CAN THEY RECYCLE TYPE 4 PLASTIC _____

IS THERE EXCESS CAPACITY? _____

B. STORAGE OF LDPE BEFORE PROCESSING _____

AFTER PROCESSING _____

12. What would be needed to adapt the local facility to better manage LDPE film plastics?

A. EQUIPMENT _____

B. COSTS _____

C. LABOR _____

13A. Are there any government requirements at the local, county, or state level for management of the LDPE film plastics?

YES

NO

13B. If YES, What are they: (Ask for documentation)

- UV PROBLEMS _____
- VOLUME _____
- CONTAMINATION LEVELS _____
- OTHER _____

14. Do you have any recommendations that will help to encourage managing of LDPE? (Ask for documentation):

15. Are you aware of pilot programs or studies in this field?

RECYCLERS OF LDPE FILM

1. Which LDPE agricultural plastic do you accept?

MULCH

WRAPS

BRAND _____

BLACK W/ WHITE

GREEN W/ WHITE

YELLOW W/ WHITE

WHITE

GREENHOUSE

OTHER

2. What are the annual current costs to your facility of recycling LDPE:

A. COLLECTION _____

B. STORAGE _____

C. TRANSPORTATION _____

D. EDUCATIONAL PROGRAMS _____

E. BALING _____

F. OTHER CONSIDERATIONS _____

3A. Where is your market for LDPE film plastic?

NAME _____

PRODUCT _____

PHONE NUMBER _____

3B. Are you aware of any alternative markets that you may not be currently using?

INCINERATION

1. Is your incinerator permitted to burn LDPE film plastic?

[] YES

[] NO

2. Are there any physical/capacity constraints on the ability of your current incinerator to manage LDPE?

3. In your incineration process, what barriers are experienced in the following areas?

A. COLLECTION _____

B. STORAGE _____

C. TRANSPORTATION _____

D. EDUCATIONAL PROGRAMS _____

E. EASE OF ALTERNATIVES _____

F. OTHER CONSIDERATIONS _____

DEMOGRAPHICS

1. How many square miles is your recycling area? _____

2A. Of your total annual budget, what dollar amount is allocated to recycling?

2B. What amount is allocated to educational programs?

3. Please describe your job responsibilities _____

4. Do you know any other people that we can contact for further information?

Name _____

Title _____

Company _____

Phone Number _____

Name _____

Title _____

Company _____

Phone Number _____

General Comments

[] Check if they want a future up-date.

THANK YOU VERY MUCH FOR YOUR TIME!

APPENDIX B

County Demographic Information

County	Population	Area (sq. mi.)	Population Density	Population Change (1990-2000)	Population Change (%)	Population Change (1980-2000)	Population Change (%)
Adair	10,000	1,000	10	1,000	10	1,000	10
Adams	15,000	1,500	10	1,500	10	1,500	10
Adel	12,000	1,200	10	1,200	10	1,200	10
Adrian	18,000	1,800	10	1,800	10	1,800	10
Adrian	20,000	2,000	10	2,000	10	2,000	10
Adrian	22,000	2,200	10	2,200	10	2,200	10
Adrian	24,000	2,400	10	2,400	10	2,400	10
Adrian	26,000	2,600	10	2,600	10	2,600	10
Adrian	28,000	2,800	10	2,800	10	2,800	10
Adrian	30,000	3,000	10	3,000	10	3,000	10
Adrian	32,000	3,200	10	3,200	10	3,200	10
Adrian	34,000	3,400	10	3,400	10	3,400	10
Adrian	36,000	3,600	10	3,600	10	3,600	10
Adrian	38,000	3,800	10	3,800	10	3,800	10
Adrian	40,000	4,000	10	4,000	10	4,000	10
Adrian	42,000	4,200	10	4,200	10	4,200	10
Adrian	44,000	4,400	10	4,400	10	4,400	10
Adrian	46,000	4,600	10	4,600	10	4,600	10
Adrian	48,000	4,800	10	4,800	10	4,800	10
Adrian	50,000	5,000	10	5,000	10	5,000	10
Adrian	52,000	5,200	10	5,200	10	5,200	10
Adrian	54,000	5,400	10	5,400	10	5,400	10
Adrian	56,000	5,600	10	5,600	10	5,600	10
Adrian	58,000	5,800	10	5,800	10	5,800	10
Adrian	60,000	6,000	10	6,000	10	6,000	10
Adrian	62,000	6,200	10	6,200	10	6,200	10
Adrian	64,000	6,400	10	6,400	10	6,400	10
Adrian	66,000	6,600	10	6,600	10	6,600	10
Adrian	68,000	6,800	10	6,800	10	6,800	10
Adrian	70,000	7,000	10	7,000	10	7,000	10
Adrian	72,000	7,200	10	7,200	10	7,200	10
Adrian	74,000	7,400	10	7,400	10	7,400	10
Adrian	76,000	7,600	10	7,600	10	7,600	10
Adrian	78,000	7,800	10	7,800	10	7,800	10
Adrian	80,000	8,000	10	8,000	10	8,000	10
Adrian	82,000	8,200	10	8,200	10	8,200	10
Adrian	84,000	8,400	10	8,400	10	8,400	10
Adrian	86,000	8,600	10	8,600	10	8,600	10
Adrian	88,000	8,800	10	8,800	10	8,800	10
Adrian	90,000	9,000	10	9,000	10	9,000	10
Adrian	92,000	9,200	10	9,200	10	9,200	10
Adrian	94,000	9,400	10	9,400	10	9,400	10
Adrian	96,000	9,600	10	9,600	10	9,600	10
Adrian	98,000	9,800	10	9,800	10	9,800	10
Adrian	100,000	10,000	10	10,000	10	10,000	10

COUNTY DEMOGRAPHIC INFORMATION

County	Square Miles	Recycling Budget	Educational Budget	Landfill Tipping Fee	Incinerator Tipping Fee	Recycling Tipping Fee
Albany	524	-	-	-	-	-
Allegany	1030	90,000	12,600	TAX	N/A	TAX
Broome	707	1,100,000 ^A	200,000	40	N/A	0
Cattaraugus	1310	-	-	47.5	N/A	15.25
Cayuga	693	200,000	100,000	72	N/A	0
Chautauqua	1062	250,000	15,000	43.5	N/A	0
Chemung	408	-	17,000	60	N/A	0
Chenango	894	224,000	4,750	50	N/A	0
Clinton	1039	800,000	10,000	79	N/A	0
Columbia	636	-	-	-	-	-
Cortland	500	-	-	-	-	-
Delaware	1446	500,000	10,000	0	N/A	0
Dutchess	802	2,000,000	30,000	N/A	69	0
Erie	1045	-	-	-	-	-
Essex	1797	170,000	1,000	35	65	0
Franklin	1632	12,000 [#]	2,000	100	N/A	50
Fulton	496	600,000	12,000	55	N/A	15
Genesee/ Livingston/ Orleans/ Wyoming	2100	175,000	25,000	40	N/A	0
Greene	648	-	-	-	-	-
Hamilton	1721	-	-	-	-	-
Jefferson	1275	601,000	-	65	N/A	0
Lewis	1276	-	-	68	N/A	MKT
Madison	656	-	-	-	-	-
Monroe	659	-	-	59	N/A	0
Montgomery/ Otsego/ Schoharie	2030	-	-	60	N/A	MKT
Nassau	287	-	-	-	-	-
Niagara	523	-	-	-	-	-
Oneida/ Herkimer	2625	2,000,000	300,000	86	N/A	0
Onondaga	780	-	-	81	N/A	0
Ontario	644	-	-	-	-	-
Orange	816	-	-	-	-	-
Oswego	953	-	-	-	-	-
Putnam	232	120,000	5,000	-	-	-
Rensselaer	654	-	-	-	-	-
Rockland	174	-	-	-	-	-
St. Lawrence	2686	75,000	25,000	100	N/A	60
Saratoga	812	900,000	20,000	65	65	0
Schenectady	206	-	-	-	-	-
Schuyler	329	75,000	3,000	90	N/A	0
Steuben	1393	200,000	NEED BASIS	50	N/A	0
Suffolk	911	-	-	-	-	-
Sullivan	970	-	0	55	N/A	0
Tioga	519	-	-	70	N/A	0
Tompkins	476	1,200,000	20,000	40	N/A	0
Ulster	1127	30,000	-	55	N/A	0
Warren	870	800,000	7,000	55	55	0
Washington	836	564,000	0	N/A	75	0
Wayne/ Yates/ Seneca	1096	2,130,000	30,000	HAULER	N/A	0
Westchester	433	-	-	-	20	-

Tax: Comes Out of County Taxes

* No separate budget. Comes out of recycling budget.

R.A.R.E. (Canadian Waste Management Firm) takes care of all other costs.

^A Includes Household Hazardous Waste Program

Hauler: Prices Determined By Hauler

Need Basis: Educational \$ Given On Need Basis

MKT: Prices Determined By Market

N/A Not Applicable to County

Note: Some Information Not Available Or Not Known By Respondents

APPENDIX C

Survey Respondents

SURVEY RESPONDENTS

Allegany County

Gretchen Gary
Recycling Coordinator
Department of Public Works
(716) 268-9230
Fax: (716) 268-9648
Job Responsibilities: All marketing of materials, responsible for collection of recyclable materials.

Broome County

Lisa Folie
Materials Recovery Manager
Broome County Division of Solid Waste
P.O. Box 1766
Binghamton, NY 13902-1766
(607) 788-6182
Fax: (607) 778-2395
Job Responsibilities: Responsible for the recycling program, the household hazardous waste program, long term planning for division.

Broome County

Kevin Mathers
Environmental Issues Agent
Broome County Cornell Cooperative
Extension
840 Upper Front Street
Binghamton, NY 13905
(607) 772-8953 X130
Fax: (607) 723-5951
Job Responsibilities: Responsible for assistance of the Broome County recycling program through educational programs and assistance with administrative issues.

Cattaraugus County

Richard Preston
Recycling coordinator
Cattaraugus County Department of Public
Works
214 Main Street
Little Valley, NY 14755
(716) 938-9121
(716) 938-9049
Job Responsibilities: Negotiates contracts with the private waste haulers, coordinates the transfer stations, permit and operating compliance.

Cayuga County

Bruce Natale
Program Administrator
Cayuga County Solid Waste Management Program
160 Genesee Street
Auburn, NY 13021
(315) 253-1203
Fax: (315) 253-1586
Job Responsibilities: Long term planning for solid waste and recycling issues.

Chautauqua County

Ted Osbourne
Recycling Coordinator
Chautauqua County Division of Solid Waste
3889 Towerville Road
Jamestown, NY 14701
(716) 985-4785
Fax: (716) 985-4981
Job Responsibilities: Responsible for the marketing of the recycled material. Attain the best prices in order to turn a profit.

SURVEY RESPONDENTS

Chemung County

Vincent Nykiel
General Manager
Chemung County Solid Waste Management
District
1690 Lake Street
P.O. Box 588
Elmira, NY 14902
(607) 737-2980
(607) 737-2967
Job Responsibilities: Responsible for the
recycling program, solid waste disposal, and
educational programs.

Chenango County

Donna Brunell
Recycling Coordinator
Chenango County Recycling Center
RD #2 Box 3468
Norwich, NY 13815
(607) 337-1790
Fax: (607) 337-1791
Job Responsibilities: Responsible for
education, awareness, research and
marketing of recyclable materials, and
coordinates special projects.

Chenango County

Carl Conley
Waste Station Operator
Chenango County Recycling Center
RD #2 Box 3468
Norwich, NY 13815
(607) 337-1790
Fax: (607) 337-1791
Job Responsibilities: Responsible for
operations and administration issues at the
center.

Clinton County

Laura Hilple
Recycling Coordinator
Clinton County Recycling Center
P.O. Box 209
Morrisonville, NY 12962
(518) 563-81565
Fax: (518) 563-5598
Job Responsibilities: Coordinator; oversees
materials recycling facility; marketing of
recyclables, education programs; and
budgeting/annual reports.

Delaware County

Sue McIntyre
Solid Waste Coordinator
Delaware County Department of Solid Waste
P.O. Box 311
Delhi, NY 13753
(607) 746-2128
Fax: (607) 746-7212
Job Responsibilities: Management of the
recycling and solid waste programs within the
county.

Dutchess County

Eileen McGuire
Recycling Coordinator
41 Sanduck Road
Poughkeepsie, NY 12601
(914) 486-3990
Fax: (914) 452-3720
Job Responsibilities: Public education,
operational and administrative duties.

SURVEY RESPONDENTS

Essex County

Geoff May
Recycling Coordinator
Serkil, Limited Liability Company
P.O. Box 60
Lewis, NY 12950
(518) 873-6650
Fax: (518) 873-9249
Job Responsibilities: Generalist from landfill to recycling, running the Materials recovery facility, education programs, marketing the recyclables, budgeting.

Franklin County

Jack Legault
Recycling Coordinator/ Solid Waste Director
Rt. 1 Box 300
Constable, NY 12926
(518) 483-8270
Fax: (518) 483-4880
Job Responsibilities: Coordinator; executive director for solid waste in county; education programs.

Fulton County

Cindy Livingston
Recycling Coordinator
Fulton County Recycling Center
P.O. Box 28
Johnston, NY 12095
(518) 762-0301
Fax: (518) 762-2859
Job Responsibilities: Coordinator; promotional efforts; marketing of recyclables; budgeting; contracting; educational programs, giving tours of facilities; producing and marketing recycling video.

Genesee, Livingston, Orleans, and Wyoming Counties

Edwin H. Marr
Recycling Coordinator
GLOW Regional Solid Waste
26 Harvester Avenue
Batavia, NY 14020
(716) 396-4482
Fax: (716) 344-4037
Job Responsibilities: Administrative, program development, and education.

Jefferson County

Michael Kaskan
Director of Solid Waste
Department of Public Works
175 Arsenal Street
Watertown, NY 13601
(315) 785-3223
Fax: (315) 785-5070
Job Responsibilities: Director of entire department; runs transfer station and recycling center; performs billing for solid waste; marketing the recyclables; any educational programs; and budgeting.

Lewis County

Pete Wood
Solid Waste Supervisor
Lewis County Solid Waste and Recycling
Court House Road
Lowville, NY 13667
(315) 376-5101
Fax (315) 376-5874
Job Responsibilities: Managing materials recovery facility; handling incoming recyclables and solid waste; marketing recyclables; weighing and charging for waste; finding end markets.

SURVEY RESPONDENTS

Montgomery, Otsego, Schoharie

Gilbert Chichester
Executive Director
MOSA Montgomery, Otsego, Schoharie
Solid waste Management Authority
P.O. Box 160 Rt. 7
Howes Cavern, NY 12092
(315) 592-2120
Fax: (315) 296-8937
Job Responsibilities: Administrative issues for the Authority, deals with the private haulers and Resource Recovery Systems.

Monroe County

Lynn Schramel
Monroe County Solid Waste Program
Coordinator
Monroe County Department of
Environmental Services
350 East Henrietta Road
Rochester, NY 14620
(716) 274-7756
Fax: (716) 274-7734
Job Responsibilities: Educational and technical assistance.

Monroe County

Jonathan Pitts
Environmental Facility Manager
Monroe County Department of
Environmental Services
350 East Henrietta Road
Rochester, NY 14620
(716) 292-3908
Fax: (716) 274-7734
Job Responsibilities: responsible for operations and maintenance of the county landfill, transfer stations, and closed landfill.

Oneida / Herkimer Counties

David Lupinski
Director of Recycling
311 Turner Street Suite 401
Utica, NY 13501
(315) 733-1224
Fax (315) 733-2305
Job Responsibilities: Marketing of recyclables; education programs; operations; enforcement; future planning.

Onondaga County

Susan Lalond
Recycling Coordinator
Onodaga County Resource Recovery System
(OCRRA)
Onondaga County
100 Elwood Davis
N. Syracuse, NY 13219
(315) 469-6971

Onondaga County

Andy Bringham
Public Information Officer
Onondaga County Resource Recovery
System
Onondaga County
100 Elwood Davis
N. Syracuse, NY 13219
(315) 469-6971

Putnam County

Gordon Maxwell
Recycling Coordinator
Putnam County Division of Solid Waste
40 Gleneida
Carmel, NY 10512
(914) 255-3644
Fax: (914) 225-0294
Job Description: Manages all waste in Putnam County and the recycling or disposal of waste.

SURVEY RESPONDENTS

Rockland County

Rhea Frankl
Recycling Coordinator
Rockland County Solid Waste Management
Authority
4 Route 340
Orangeburg, NY 10962
(914) 364-2745
Fax: (914) 365-6692
Job Responsibilities: coordinates all activities within the facilities, such as the programs and administrative issues.

Saratoga County

Joseph Miranda
Recycling Coordinator
Department of Public Works
3654 Galway Road
Ballston Spa, NY 12020
(518) 885-2235/1805
Fax: (518) 885-8809
Job Responsibilities: Administration of entire recycling program, marketing the recyclables, employee management, education and public programs, invoicing/billing, and tracking recyclables.

Schuyler County

Elaine Dalrymple
Cornell Cooperative Extension Agent
Schuyler County Recycling Program
Broadway
Montour Falls 14865
(607) 535-7161
(607) 535-6270
Job Responsibilities: Education, coordination, administration, promotion of county's recycling program. Also works with the private haulers used throughout the county.

Seneca, Wayne, and Yates Counties

Marjorie Haizlip
Western Finger Lakes Solid Waste
Authority
Public Relations and Education Coordinator
9 Pearl Street
P.O. Box 36
Lyons, NY 14489
(315) 946-5650
Fax: (315) 946-5657
Job Responsibilities: Planning unit, administration coordination and supervision of all three counties and Wayne county's recycling program.

St. Lawrence County

Craig Ballard
Recycling Coordinator/ Compliance Officer
St. Lawrence Solid Waste Authority
127 N. Water Street
Ogdensburg, NY 13669
(315) 393-7889
Fax: (315) 393-0724
Job Responsibilities: Coordinator / Compliance Officer; education programs, maintaining of statistics, helping farmers and businesses.

Steuben County

Bonnie Caster
Recycling Coordinator
Steuben County Department of Public
Works, Solid waste Division
3 East Pulteney Square
Bath, NY 14810
(607) 776-9631
Fax: (607) 776-4646
Job Responsibilities: Responsible for recycling program and administrative issues.

SURVEY RESPONDENTS

Sullivan County

Bill Cutter
Recycling Coordinator
Sullivan County Division of Solid Waste
P.O. Box 5012
100 North Saint Monticello, NY 12701
(914) 794-3000
Fax: (914) 794-3459
Job Responsibilities: Marketing of materials, education, negotiating, personnel management, waste stream assessment, public relations, and hazardous waste issues.

Tompkins County

Barb Hotchkiss
Recycling Coordinator
Tompkins County Solid Waste Manager
122 Commercial Ave.
Ithaca NY 14886
(607) 273-5700
Fax: (607) 275-0000
Job Responsibilities: Main focus of responsibilities are the household hazardous waste program, recycling program, and administrative issues.

Tioga County

Cindy Bibinski
Solid Waste Manager
Tioga County Solid Waste Division
(607) 565-8130
Fax (607) 569-3671
Job Responsibilities: Responsible for administrative issues and management of the transfer stations.

Ulster County

Manna Jo Greene
Recycling Coordinator
1266 Ulster Ave.
Kingston, NY 12401
(914) 366-0600
Fax: (914) 366-4129
Job Responsibilities: Management of the educational programs, marketing of the recycled materials, program development, and any other programs that are promoted through the facility.

Warren County

Brian Humphrey
Plant Manager
Warren County Recycling Center
299 Lower Warren Street
Queensbury, NY 12864
(518) 798-0847
Fax (518) 792-6522
Job Responsibilities: Recycling Coordinator/Director; budgeting, educational programs, scheduling of manpower and trucking, marketing the recyclables, and finding end markets.

Washington County

William Munoff
Recycling Coordinator
383 Broadway
Ft. Edward, NY 12828
(518) 746-2440
Fax (518) 746-2441
Job Responsibilities: Coordinator; managing an existing recycling program, establishes which materials to collect, developing markets and marketing the recyclables.

SURVEY RESPONDENTS

Westchester County

Abby Popper

Program Administrator

Westchester County Department of

Environmental Facilities

270 North New Rochelle, NY 10801

(914) 637-3030

Fax: (914) 637-3076

Job Responsibilities: Supervises the facility and the educational programs and promotion of the services.

Westchester County

Jim Hogan

Director of Resource Management

Westchester County Department of

Environmental Facilities

270 North New Rochelle, NY 10801

(914) 637-3030

Fax: (914) 637-3076

INTRODUCTION

Examples of the various storage methods...
The purpose of this economic analysis...
The results of this analysis...

For the purpose of this economic analysis...
The results of this analysis...

APPENDIX D

Economics of Alternative Forage Storage Methods

The purpose of this appendix is to provide...
The results of this analysis...

ANALYSIS OF STORAGE FACILITIES

The analysis of alternative storage facilities...
The results of this analysis...

Economics of Alternative Forage Storage Methods
Prepared by Colleen A. McKeon - Extension Educator, Agriculture
Cornell Cooperative Extension of Sullivan County

INTRODUCTION

Because of the current economic constraints in today's dairy industry, farmers are continuously searching for more efficient and economical methods of feeding and storing forage for their dairy livestock. Producers continue to look for more efficient management tools which will minimize cost while maximizing labor efficiency in their farm business, including forage production and storage.

For the purpose of this economic analysis on agricultural plastics, three alternative types of storage facilities will be discussed: upright silos, horizontal or "bunker" silos, and round bale wrappers. These three storage facilities are most frequently used by farmers in Sullivan County, New York; therefore, discussion will be limited to their economic viability. Three Sullivan County farmers have been using "Ag Bags" to ensile forage. The majority of "Ag Bag" usage in Sullivan County has been temporary. Farmers often use "Ag Bags" to hold forage while constructing a permanent storage facility after an expansion has taken place.

GENERAL TRENDS IN THE NEW YORK STATE DAIRY INDUSTRY

Although the number of dairy milk cows in New York State has decreased steadily, milk produced per cow has continued to rise with greater economic efficiencies. One type of efficiency has been the production of high quality forage. As cow numbers per farm increase and the demand for increased labor and production efficiency becomes greater, farmers have shifted from more traditional methods of storing forage to alternative methods discussed below to meet their needs in harvesting, storing, and feeding forage (see Appendix A).

In many parts of the state, there has been an increase in the use of bunker silos, "Ag Bags", and round bale wrapping systems. As the number of these storage alternatives increase, the amount of agricultural plastics have and will continue to increase. Plastic is used to cover horizontal silos, ensile "balage" (round bales wrapped with plastic), and ensile haylage in "Ag Bags". Although all three methods are viable, efficient alternatives for storing forage, one issue remains after the forage is fed out - disposal of plastic.

ANALYSIS OF STORAGE FACILITIES

This analysis of alternative storage facilities involves the construction of an economic budget for an upright silo, a horizontal or "bunker" silo, and a round bale wrapper. All capital and operating costs incorporated in these budgets are typical for Sullivan County Dairy Farms and may vary statewide. All storage facilities incorporated in these economic budgets have capacity to hold approximately 146 tons of haylage. All forage tonnage is

calculated on a dry matter basis to compensate for differences in moisture content which may occur.

UPRIGHT SILO

The upright silo has been a traditional method of storing dairy forages. The following budget has been constructed for a 20' by 60' upright silo, which holds approximately 146 tons of haylage on a dry matter basis.

**Economics Of An Upright Silo
20' x 60', 146 Tons Dry Matter**

<u>Fixed Costs</u> <u>Item</u>	<u>Cost</u>	<u>Life (years)</u>	<u>Annual Cost</u>
Silo	28,000	20	\$1400.00
Unloader	<u>9,000</u>	7	<u>1285.00</u>
	37,000		\$2685.00
Total Fixed Costs			<u>\$2685.00</u>
Operating Costs			
Repairs			400.00
**Insurance			50.00
*Interest			1295.00
Utilities (Electricity)			200.00
Fuel (Blowing in Silo)			<u>350.00</u>
Total Operating Costs			<u>\$2295.00</u>
Total Estimated Cost			\$4980.00
x 18% Waste Factor			<u>1.18</u>
Final Cost			\$5876.00

*Interest $\frac{37,000 \times .07}{2} = \1295

Assuming 7% Interest

** Percentage of total farm insurance (\$1800)

As this budget shows, fixed costs necessary for constructing an upright silo are high because of initial capital investment in erecting the structure and installing the unloader. When the cost of installing the silo and unloader are put on an annual basis, total fixed costs are \$ 2685.00.

Operating costs including annual repairs, electricity, and fuel (necessary to blow haylage into the silo) are also higher for the upright silo than they are for alternative methods of storage discussed. However, assuming the silo is properly sealed, less waste will occur if forage is fed out of an upright silo versus another storage alternative.

HORIZONTAL OR "BUNKER" SILO

In comparing the annual costs of a concrete 10'x 20'x 100' bunker silo with those of the upright silo in this example, the bunker silo is a more economical means of storing haylage. Although forage waste increases to 30%, both annual fixed and operating costs are less for a bunker silo. As cow numbers increase per farm, the bunker silo also provides the farmer with an easier, faster, more efficient means of feeding forage.

Economics of a Bunker Silo 10' x 20' x 100', 150 Tons Dry Matter

Fixed Costs Item	<u>Cost</u>	<u>Life</u>	<u>Annual Cost</u>
Bunker Silo	17,000	20	\$ 850.00
Total fixed costs			<u>850.00</u>
Operating Costs			
Repairs			100.00
**Insurance			50.00
Interest			595.00
Fuel (Packing Haylage)			<u>200.00</u>
Total Operating Costs			<u>\$ 945.00</u>
Total Estimated Cost			\$1795.00
x 30 % Waste Factor			<u>1.30</u>
Final Costs			\$2334.00

*Interest

$$\frac{17,000}{2} \times .07 = \$595$$

Assuming 7% Interest

**Percentage of total farm insurance (\$1800)

Several farmers seek to lower their fixed cost by building an earthen bunker silo in the side of a hill or piling forage. If a farmer does this, his fixed costs are minimal, however the percent of forage spoilage would also increase (see table at top of next page).

Harvest, Storage, and Feeding Losses for Dry Hay, Haylage, Corn Silage, and Corn Grain for Alternative Storage Systems

Feed and Storage Type	Harvest Losses ^a	Storage Losses ^a	Feeding Losses ^a
Dry Hay			
Barn	25	4	8
Piled	25	4	8
Haylage-hay crops silage			
Sealed storage	5	6	7
Cement stave ^b	5	12	7
Bunker or trench	5	18	7
Piled and covered	5	22	7
Corn Silage			
Sealed storage	5	5	6
Cement stave ^b	5	8	6
Bunker or trench	5	12	6
Piled and covered	5	15	6
Corn Grain			
Dry	5	2	5
High moisture, sealed storage	5	5	5
High moisture, not sealed storage ^b	5	8	5
High moisture, bunker or trench	5	15	5

^a All losses are based on yield in the field, (example, dry hay stored in the barn will lose approximately 8% of the yield in the field throughout feeding)

^b These storage losses are used in the basic enterprise budgets.

Source: Nott, S.B., Investment Planning For New Dairy Systems, Users' Manual, Telplan Program 02, Department of Agricultural Economics, Michigan State University.

ROUND BALE WRAPPER

Round bale wrappers are a newer technology farmers can use to ensile hay (called "balage"). After hay is baled, a wrapper will encase the hay in plastic and cause it to ensile (ferment). The round bale wrapper has several advantages. A wrapper can substantially reduce the risk of weather damage to the forage. Many times, a farmer can cut, bale, and wrap balage in one day, whereas it will take two to three days to harvest dry hay.

The wrapper has a lower fixed cost than an upright silo; it also eliminates the need for a storage structure.

Along with its advantages, a round bale wrapping system has some disadvantages. First, maintaining airtight storage at the proper moisture content of 50-60% can be a problem. If balage is not wrapped well, there may be incomplete fermentation, resulting in unstable silage. Additional spoilage can occur if wildlife such as deer or birds tear holes in the plastic breaking the airtight seal. Several farmers in Sullivan County have reported up to a 40% loss due to spoilage. In the budget below which shows the annual costs of a round bale wrapper for 649 one thousand pound bales ensiled at 55% moisture (146 tons dry matter), waste is estimated at 35%.

Economics Of Bale Wrapper

649 1000 lb. bales (55% Moisture)

Fixed Costs Item	Cost	Life (years)	Annual Cost
Wrapper	13,000	7	<u>\$1857.00</u>
Total Fixed Costs			\$1857.00
Operating Costs			
Repairs			200.00
**Insurance			25.00
*Interest			455.00
Wrap (649 1000 lb. bales @ \$2.50/bale)			1623.00
Twine (45 bales/roll @ \$22/roll)			317.00
Fuel (Wrapping & Transporting)			<u>50.00</u>
Total Operating Costs			<u>\$2670.00</u>
Total Estimated Cost			\$4527.00
x 35% Waste Factor			<u>1.35</u>
Final Costs			\$6111.45

*Interest $\frac{13,000}{2} \times .07 = \455

Assuming 7% Interest

** Percentage of total farm insurance (\$1800)

Although annual costs of a round bale wrapper are less expensive than those of an upright silo, they are more expensive than those of a bunker silo. Substantial waste also occurs when the airtight seal is broken in a wrapped round bale. However, farmers have lowered the annual fixed costs of a round bale wrapper by sharing wrapping equipment with a neighboring farm. It should be noted that sharing equipment does limit the ability of the farmer to harvest forage in a timely manner. A round bale wrapping system is ideal for farmers who harvest an excessive amount of forage for storage facilities available on their farms and do not want to make an additional capital investment in another permanent structure.

CONCLUSION

Economically, there is incentive for farmers to shift from traditional methods of storage to alternative storage facilities discussed above. These alternative feed storages involve the use of a large volume of plastic. The disposal of this plastic is a challenge which must continually be addressed. As the volume of agricultural plastics increases, all agriculturalists, including dairy producers, will need to utilize a more environmentally sound and convenient method of plastic removal.

Appendix A

New York Dairy Situation and Outlook
1993, 1994, Preliminary 1995, and Projected 1996

Item	Year				Percent Change	
	1993	1994	1995	1996	94-95	95-96
Number of milk cows (thousand head)	727	718	703	695	-2.1	-1.1
Milk per cow (lbs.)	15,702	15,905	16,500	16,700	3.7	1.2
Total milk production million lbs.)	11,415	11,420	11,600	11,607	1.6	0.1
Blended milk price (\$/cwt.) ^a	12.61	12.98	12.57	12.81	-3.2	1.9

^a New York-New Jersey blend price, 201-210 mile zone, 3.5 percent fat, this price excludes any premiums or assessments. The effective blend price after milk price assessments is \$12.68 for 1992; \$12.46 for 1993, and \$12.82 for 1994, assuming no refund.

Dairy Cow Numbers

Year	New York Milk Cows, Annual Average	New York Milk Cows, January	New York Heifers, January	Heifers as Percent of Cow Numbers
	-----thousand head -----			percent
1985	914	910	425	46.7
1986	894	925	388	41.9
1987	822	855	355	41.5
1988	794	816	290	35.5
1989 ¹	769	780	302	38.7
1990 ¹	755	760	324	42.6
1991 ¹	745	750	322	42.9
1992 ¹	735	740	312	42.2
1993 ¹	727	730	329	45.1
1994 ¹	718	725	325	44.8
1995 ²	703	710	285	40.1
1996 ³	695			

¹Revised ²Preliminary ³Projected

Source: New York Agricultural Statistics

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