

Agricultural Plastics Recycling in New York State

Case Study

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The case study looks at the NYS Recycling Agricultural Plastics Program under NYS Department of Environmental Conservation (DEC), New York Farm Viability Institute and USDA NIFA funds. This case study summarizes the efforts and success of the program during operation, as well as an update of what has happened in the counties since.

BACKGROUND

In the mid 1990's there was an awakening to the challenge of agricultural plastic disposal challenge. In the dairy industry, agricultural plastics appear as silage and haylage bags, bunker silo covers, bale wraps and twines; in the nursery industry, as hoophouse covers, trays and containers; in fruit and vegetable production, as row covers and mulch films; and in all agricultural sectors in pesticide containers. Additionally, many farms were using plastic mulches and silage bags instead of silage structures. One easy way to dispose of plastic was to burn it or throw it into a farm dump but eventually markets prepared to recycle the materials, only to realize that there was too much contamination to process most of it. Within six months the markets were gone.

Coalitions from the northeast states including New York, New Jersey, Vermont, New Hampshire, Pennsylvania, Connecticut and Massachusetts held meetings to try and

address the collection and sound disposal of agricultural plastics. In 2004 there were several locations in the north country of NYS that were interested in trying to collect and recycle linear agricultural plastics and large pesticide containers. A pilot program in St Lawrence County had a grant to quantify and characterize the amount and type of waste agricultural plastic and to provide farmers with a one-time, no tip fee disposal program. Through this process, the farmers were be given an awareness of local solid waste transfer facilities, procedures and the costs associated with use of a proper municipal landfill. It was hoped that through this process farmers will be more likely to reduce the tonnage (through proper handling and storage) and to budget for municipal disposal at their local solid waste transfer stations in the future.

In total, 105.31 tons of plastic were collected from August 2, 2004 to June 30, 2005. Four of the five available transfer stations in St. Lawrence County were used

82 times by 45 farms. Lewis County transfer station dedicated a baler two days per month for farmers to bring plastic for baling in a stationary baler. At that point, Ag Bag was hauling trailer loads back to their headquarters in Oregon in hopes of recycling it. Additionally, there were efforts in Otsego County, where there were citizens concerned about the air emissions from burning of these plastics (they are still baling but current market availability varies greatly).

INTRODUCTION

When the NYS Recycling Agricultural Plastics Program (RAPP) was launched the goal was to increase recycling agricultural plastics through education, outreach, and baling of agricultural plastics for shipment to special recycling facilities within the United States and abroad (only if no domestic options were available).

Agricultural plastic education was key and included the following points and difficulties:

- Collection, storage and keeping the plastic clean enough to recycle.
- Providing BigFoot BF300 mobile balers to compact used plastic into dense, stackable bales that are efficient to store and transport.
- Collaborating with local partner agencies, organizations and businesses to create recycling systems that benefit farmers, the environment and the economy.
- Working with plastics manufacturers to explore ways to process difficult-to-recycle agricultural plastics into new “made in the USA” plastic products.

TEAMWORK

RAPP worked with a network of outreach educators, generally Cornell Cooperative Extension (CCE) County Associations. These relationships focused in on their role of recruiting plastic recycling participants, maintaining contact with current participants and providing training and education in preparing plastic for efficient recycling. These outreach educators were crucial to the functionality of RAPP, as they ensured best management practices for recycling. Additionally, participation of local Solid Waste Management was essential for the sustainability of agricultural plastics recycling.

RAPP established a set of project partners in SWCD and CCE agencies to represent RAPP in their areas and carry out fieldwork. These agencies were reimbursed for their efforts within the constraints of funding limitations and gaps. The initial partner agreements were developed with the SWCDs to support the Cooperation Agreements made between six of these agencies and the NYS DEC to manage the six BigFoot balers purchased for the project. Most of the money allocated in the first cycle of contract funding went towards the purchase of these balers. The money to purchase the balers flowed through Cornell, with NYS DEC retaining ownership, the SWCD Cooperators given management rights, while defacto management responsibilities resided with RAPP. Per the terms of the Cooperation Agreements, the SWCDs were required to work cooperatively with RAPP, but were not under obligation to carry out any tasks without receiving reimbursement.

In other areas of New York, five mobile BigFoot balers were used in contract with neighboring counties. During the winter of 2015, Lewis County SWCD assumed the cooperater agreement for the Jefferson County baler and Cornell Cooperative Extension of Wyoming County assumed the cooperater agreement for the Wyoming County baler. Ongoing efforts in the North Country resulted in 156,000 lbs. of plastic being moved to TAP Industries for processing. TAP Industries received a Regional Economic Development Council (REDC) grant in December 2014 to help complete their processing line. In the past, moving bales to storage and/or market locations were carried out largely with RAPP funding. As this was not financially sustainable, RAPP met with Solid Waste and Recycling Authorities regarding the acceptance, storage and recycling of agricultural plastics.

As storage locations were established in each part of the state, farmers, marina operators and other generators can self-convey plastics (baled, in Super Sacks®, loose, or in some other manner) to designated locations. Delaware and Madison Counties fully adopted this approach, but in Otsego County SWCD notified Casella where baled material was located and Casella trucks pick up bales as it fits their schedule.

Meetings with Otsego County Solid Waste, SWCD, Otsego County Conservation Association, and Casella Resource Solutions resulted in four collections, two in the spring and two in the fall of 2015. Approximately 14,000 lbs. of agricultural plastic were brought in, largely from commercial producers but also homeowners with wood pellet bags.

Additional collections were held in May of 2016. For smaller producers, Otsego County wanted to shift from baling on farm to receiving at collection locations.

RAPP met with Solid Waste Divisions of Chautauqua and Cattaraugus Counties as well as SWCD and CCE staff from both counties that are interested in participating. Both counties were assessing their resources and potential for Solid Waste to divert agricultural plastics to recycling. Cattaraugus County Solid Waste offered two sites for collection and baling of agricultural plastics. Extension was working to educate farmers and a bale of Super Sacks® was left with SWCD and Extension for distribution. Agreement was subsequently reached with Chautauqua County SWCD to receive the Washington County baler and increase collection of agricultural plastics in the county. The cooperater agreement was signed in the winter 2015. To date, limited plastic collection and baling has occurred, but a significant number of farms had committed to participating.

Work has been ongoing to identify alternative methods to move baled plastics to markets. Discussions with solid waste authorities and private haulers have identified several alternative methods of collection and transport of agricultural plastics for recycling. St. Lawrence County Solid Waste indicated that they have transportable compaction containers that could be used for transporting material straight to market without baling. Wheelock Disposal, Winfield, NY, supplied 40-yard roll-off containers, with the ability to move up to 24,000 lbs. of plastic at one time for agricultural plastics delivery to NBF Plastics. A walking floor tractor-trailer was also

successfully used to load bales on a farm that had no loading dock.

RAPP assisted Madison County Department of Solid Waste with their interest to build a plastics-to-fuel facility to process agricultural and other plastics. A Regional Economic Development Council grant proposal to attract a company was unsuccessful, however five companies submitted proposals to a recent RFP. In the end, the facility was not built.

In addition to the collection, recycling, and outreach, RAPP included an educational component. The dedicated website is located at: <http://www.recycleagplastics.css.cals.cornell.edu/>. Educational materials can be found at <http://www.recycleagplastics.css.cals.cornell.edu/agplastics2.htm>, including short "fact sheets" for best management practices on preparing and storing plastic for collection/baling. A small number of these were printed and laminated as double-sided posters and distributed at events. Additionally, a map shows baling activity and locations, Super Sack® locations and locations where RAPP education occurred (located at <http://compost.css.cornell.edu/RAPPmaps.html>).

For community presence and exposure, RAPP had displays at Empire Farm Days, a three-day event held annually in Seneca Falls, NY. The booth attracted several hundred visitors, approximately 50 people had specific follow up requests related to recycling their plastics. A significant number of farmers expressed interest in the proposal to collect and divert agricultural plastics from the Ontario County landfill.

Additionally, in September 2014, Broome County CCE invited RAPP to speak at the Broome County Local Government Training. A 45-minute presentation titled "Agricultural Waste: Role of Farm and Municipality" was presented to 62 attendees. Additional outreach was conveyed through displays at the annual NYSAR3 conference and trade show in Cooperstown, November of 2013-2015, which was a good opportunity to interact with solid waste personnel, recycling coordinators and private industry.

For assistance in baling, a BigFoot Baler Instructional Video was added in English and Spanish to the website, as well as the Baler Maintenance Manual.

TYPES OF EDUCATIONAL EVENTS IN NYS:

-In August 2013-2015, RAPP hosted displays at Empire Farm Days, a 3-day annual event held in Seneca Falls, NY. The event attracts 10,000 farmers from the northeast.

-Broome County CCE invited RAPP to speak at Broome County Local Government Training. A 45-minute presentation titled "Agricultural Waste: Role of Farm and Municipality"

-Displays and discussion at NYS Association of Reduction Reuse and Recycling conference in Cooperstown, NY

-Demonstrations and Outreach at county fairs and Dairy Days throughout the state.

-Collaboration with states that border NYS.

-Cornell Cooperative Extension Chautauqua County spoke to four groups including USDA

- Seneca Trail Resource Conservation and Development Council (RC&D) regarding RAPP. RC&D expressed support for the program.
- Cargill Animal Nutrition in Liverpool was able to connect with NBF Plastics in Auburn to move 11,000 lbs. of Super Sack® bulk bags largely for reuse.
- Delaware County CCE had an intern putting significant effort into recruiting “hold out” farms and training regarding collection BMPs
- Presentation to Farmland Protection Board in Chenango County
- Baling demonstration was performed using plastic from 3 farms at Chenango County Dairy Day.
- A RAPP booth/poster and pamphlets at the Afton Fair and Chenango County Fair
- Otsego County Conservation Association personnel did 9 farm visits in which they discussed BMPs with participants over the recent time period. Recruiting then switched to advertising and phone calls and promoted RAPP on WSRK and WDOS radio stations.
- A display was set up with RAPP information at several festivals and the County fair (Otsego Lakes Festival twice, the Goodyear Lake Festival and the County Fair twice). SWCD also reported three times about RAPP activities to the Otsego County Solid

Waste and Environmental Concerns Committee.

- Casella hosted a meeting with Ultra-Poly, the recycler from PA, County Planning, CCE and RAPP. We visited Casella’s Zero-Sort facility as well as a farm and a marina. Ultra-Poly expressed strong interest in recycling greenhouse film and possibly boat wrap.
- AgriPalooza 2014 and 2015, a fun-filled day on the farm designed for the general public to experience and enjoy learning about modern day farming, attendees got to watch a baling demonstration and take home printed material about agricultural plastics recycling.
- A display table with information was set up at Artisan Villa in September, the Harvest Fest in the Warsaw Village Park in October 2014.

EFFORTS BY COUNTY

Cayuga County

Participants: Cayuga County had a total of 15 interested farms, 11 of which were dairy farms, two beef producers, one horticulture operation and one marina.

Chautauqua County

Participants: Chautauqua County, 18 farms were saving plastic. These were primarily dairy and livestock farmers and one agricultural business. A couple of the farms were in Cattaraugus County.

Plastic Activities: Since starting the program, the winter of 2015/16 represents

the period with the largest amount of plastic used and saved for recycling. Chautauqua County SWCD had the cooperator agreement and coordinated baling with the farms.. Twenty-one bales of plastic had been generated for recycling, 13 were being stored at the NYP Management Company facility and five were at the Agriculture Service Center in Jamestown and three remained on the farms where they were baled.

Chenango County

Participants: Chenango County CCE has generated interest with 30+ farms in Broome and Chenango Counties. The farms/businesses that have saved plastic for recycling include 12 dairies, two livestock, and one horticulture operation. The Chenango County DPW and their North Norwich Recycling Center had been active participants in the program by baling and storing agricultural plastics.

Plastic Activities: Chenango County DPW had been limiting outreach for baling in 2014 due to a lack of storage. After having rented a storage container, they were able to build a storage facility for agricultural plastics in 2015 through a grant from the Constitution Pipeline to CCE. Approximately 6 farms have been actively bringing bale wrap into the recycling center. 14,000 lbs. of agricultural plastics were shipped.

Delaware County

Delaware County has a county owned and operated landfill, materials recovery facility, and compost facility which is funded through sales tax. They have three operating balers, one of which is used for agricultural plastics. They sent a load of plastics to a customer in Malaysia spring 2019, a zero-sum deal. They have yet to

hear if the plastic was adequate and will continue to be accepted, but should know in a couple months. If it is, it will help out the farmers and the environment. The farmers currently drop their plastic off at the MRF and it is baled on Mondays. They make one or two bales per week, and they have to accrue 40,000 lbs. to make weight for the international shipping containers. Contamination is a challenge the county gives out free 4'x4' totes, farmers collect the plastic in the tote.

CCE is active in providing education in the region, with frequent trainings and outreach events. They may have found a local feed company to donate more 4x4 totes, which is important as the totes can only really be used three to four times.

Plastic Activities: Plastics are collected at the Delaware County Solid Waste Facility. They are brought in by participating farmers using bulk bags. During the winter of 2015/16 the county surpassed a 50% collection rate for used agricultural plastics in the county. This created some challenges as some farms have to drive a long distance to the recycling center. There was consideration regarding opening one or more local transfer stations for agricultural plastics. During the autumn of 2015 and winter 2016, Delaware Solid Waste shipped 70,630 lbs. of agricultural plastics to market, donating the proceeds to run RAPP.

Chemung SWCD

SWCD owned their own baler and had 8 very active farms recycling plastic however the majority of plastic comes from one farm. Since their last shipment in July 2015, these farms collected and baled ~35,000 lbs. of plastic and were almost ready to ship another load to market.

Clinton County SWCD

SWCD owned and supplied two mobile balers to farms primarily in Clinton and Essex Counties. Large numbers of bales of plastic have been generated and not marketed due to the lack of logistics to move them to a central shipping point.

TAP Industries had been taking in baled agricultural plastics. Approximately 80 bales were moved from Clinton County to TAP Industries in 2015. Approximately 80,000 pounds of additional material had been baled in Clinton (~45,000 lbs.) and Essex (~35,000 lbs.) Counties and awaited shipment to market. Conveying bales to markets for all counties has been a challenge.

Franklin County

Participants: Approximately 66 farms in Franklin, Essex and Clinton Counties are participating with RAPP. A number of the participants are maple producers. Franklin County Extension educators have been working very closely with TAP Industries, a materials recovery/reclamation/recycling facility that receives, separates and prepares recyclable materials for marketing to end-user manufacturers. TAP Industries was working on a processing line involving agricultural films; i.e. hay and silage bale wrap, feed bags, bunker cover, as well as maple tubing, nursery and greenhouse film, horticultural pots and trays, agricultural jugs, drums, and pails, and wood pellet bags. TAP Industries' management would like to receive these plastics from any location, where it is logistically possible. The cost of transportation appeared to be their foremost limiting factor, but it was believed that this would diminish as their facility becomes fully operational and all

agricultural plastic that was collected could be made into new plastic.

Plastic Activities: 121 bales were picked up from Franklin, Clinton and Essex counties and moved to TAP Industries' facilities in Malone or Plattsburgh during the summer of 2015. The Clinton County SWCD baler continued to bale on-farm in Clinton and Essex Counties. As of March 31, 2016, Franklin County CCE is assisting with coordinating picking up 40,000 + lbs. in Clinton County.

Jefferson County

SWCD had used a program supplied BigFoot baler until September 2014. Jefferson County SWCD notified DEC that they were ending their participation in the program. This came about due to a reduction in staff and funding. Lewis County SWCD has since assumed the baler cooperator agreement.

A number of participating farms and all of the marinas desire to have a continuation of RAPP in Jefferson County. Jefferson County Solid Waste (part of County Highway) was unable to manage the full program but can assist with receiving and shipping baled materials. Lewis County SWCD would be willing to make the baler available, and had, but was unable to manage operations outside their county.

The Development Authority of the North Country (DANC), a solid waste management facility who own and operate the regional landfill, took over the agricultural plastics operation. The materials management coordinator was from the SWCD originally and had an interest in agricultural plastics will recycle as much material as possible. They are not currently baling because there are no markets.

The baler is still functional and maintained however, they find that the balers are not user friendly. Additionally, if the farmers do a poor job managing and cleaning their plastic, it leaves a messy disaster of manure, feed, water, mud, mosquito larvae and rotting grass. An auto feed baler would be better suited to the county's needs, or the plastic needs to be shredded to reduce the size of the sheets for manual feeding.

The Development Authority of the North County looked at Delta Plastic's Wisconsin project: Revolutions Plastic (<https://www.revolutionplastics.com/index.php>), which was attempting to replicate in NYS, but failed. The plastic exists in the region for success, and the model has seen success in Wisconsin, but if there are no markets, there is no point. However, the agricultural plastics are also bad for the landfill, so an answer has to be found.

Lewis County

SWCD assumed the cooperator agreement for the former Jefferson County BigFoot baler during the winter of 2015. Twenty-four bales of plastic were generated on 11 participating farms and in August of 2015, 15,534 lbs. of plastic were shipped to the Brooklyn market, combined with 19,000 lbs. from Jefferson County. An additional 5,000 lbs. of plastic was baled during the autumn of 2015. As of March 31, 2016, SWCD had been unable to start baling plastic saved by farms during the recent winter months.

The Lowville transfer station had expressed willingness to resume collections of plastic. This was done in the past and they have continued to receive baled agricultural plastics to load for shipping to market. This

would be taken into consideration with any plans developed by DANC.

Agricultural plastics were collected from 11 Lewis County farms and SWCD collected/diverted 30 bales (30 tons) of agricultural plastics. At a \$72 per ton tipping fee if landfilled, this program save farmers \$2,160. Lewis County had been driving the baler around to farms, but would rather have had it stationary to save time, with farms dropping the bale wrap off at one central location.

Madison County

Madison County has their own Materials Recovery Facility (MRF), and thus their own baler. As they have to market their own recyclables anyways, they have continued to recycle agricultural plastics. With such a large agricultural community the Department of Solid Waste felt they had to continue to support agricultural plastics recycling despite RAPP's ending.

Madison County baled and shipped approximately 160,000 lbs. of plastic for processing into fuel. RAPP helped arrange both of the processors for Madison County Solid Waste. Solid Waste shipped 44,040 of agricultural plastics to market for recycling in February 2016. This material went to the Brooklyn trash bag manufacturer.

Madison County continued to try to attract a plastics-to-fuel plant to the Madison County Agriculture and Renewable Energy Business Park to process hard to recycle plastics from Madison County, diverting them from the landfill. They would also accept plastic regionally. They received 5 proposals to their RFP for plastics-to-fuel processing.

Currently they accept HDP (at the MRF) and LDP bale wrap (for trash), even though

export markets dried up about two years ago. They are currently working with Delta Plastics out of Arkansas, who will pick up HDP silage tubes for free, but will not accept LDP (which is the majority of the plastic in the county). They have two trailer loads of HDP stored and staged. They are sitting on about 60-80,000 pounds of LDP, about 30-40 tons, but it would cost about \$200/ton to manage. Madison County would like to see the agricultural suppliers be held responsible for the plastics, with them being shipped back to the companies for recycling after use. This forced responsibility would likely bring about long-term and creative solutions. The agricultural community fully converted to tube and wrap, so someone has to subsidize the cost.

The county does have an RFP for plastics to oil, but this method seems overly optimistic. They lack the volume for proper execution (100,000 tons would be needed just to feed it) and the technology is incredibly expensive.

The recycling center will not be willing to take the LDP until there are long term contracts with sustainable markets in place. At least three-year contract windows are needed to validate the costs and education efforts/message.

Ontario County

The Ontario County Planning Department included agricultural plastics recycling in their updated Solid Waste Management Plan. The county had placed a priority on diverting potentially recyclable materials from their regional landfill. Cornell Cooperative Extension staff have taken the lead in interacting with the agricultural community as well as facilitating discussions between the County and Casella Waste

Systems, which manages the landfill and the recycling center, regarding the agricultural plastics.

Ontario County Planning requested CCE Ontario County to survey farms in Ontario County to better estimate the types and amounts of plastic used. RAPP partnered with CCE in doing this and funded CCE to hire a summer college intern to manage the survey. Three hundred-seventeen in-depth surveys were mailed to area farms and 131 were returned, showing very high interest. Farmers expressed willingness to recycle about 60 tons of used plastics. Given that Casella collects regionally and 60% of the farms in Ontario County did not report, real potential is considerably higher. Casella was exploring the logistics of collection. There was a farm tour including RAPP, Casella, CCE and County Planning in July of 2015 where three farms, representing different types of plastic, were visited. This allowed Casella and County Planning staff to better understand where the plastic is and how it can be collected.

Otsego County

Participants: Over 45 farms were recruited through OCCA and SWCD although the majority of the plastic is collected from about 15 farms. Most of the participants were dairy farmers in Otsego County, but there were three farms in Herkimer County that had been recruited by these two entities.

Plastic Activities: Otsego County SWCD has a BigFoot 300 baler and coordinates baling. Most baling to date had been on-farm. The local RAPP team expanded to include Casella Resource Solutions and County Planning. This resulted in two spring collections at the Southern Transfer Station in Oneonta and two fall collections one in Oneonta and one in Cooperstown. Over

15,000 lbs. of plastic were delivered by area farmers. Wood pellet bags were added to the collections. Over 70,000 lbs. of plastic was baled. In most cases, the plastic collected was good quality. 65,685 pounds of plastic were shipped to the plant in Brooklyn in 2016.

Otsego County still has a functional baler in the possession of their soil and water conservation district, but it is just being held there. After RAPP funding ran out, the Otsego County Conservation Association was brought in to help with education and outreach to farmers, while the SWCD was working on baling with county waste. OCCA is currently sitting on about ten bales with nowhere to dispose of them. They would be interested in continuing effort if there was a method and a market, and the SWCD was getting funding from the solid waste department directly during the last two years of the program, because they are progressive and motivated to mitigate the problem of agricultural plastics, but without a market they could not continue. However, they would like to hold onto their baler for the foreseeable future as they continue to research possibilities.

St. Lawrence County

St Lawrence County was no longer participating with RAPP but farm interest remains high. Both DANC and St Lawrence County Solid Waste are interested in developing a plan that may involve collecting agricultural plastics periodically at several transfer stations.

Suffolk County SWCD

Suffolk County SWCD had a BigFoot 400 baler that mechanically pulled plastic off of greenhouses and bales it. Due to staff changes SWCD suspended their agricultural plastics program in 2015/16 and stored the

baler at North Fork Nursery. Efforts largely through the USDA Berry Tunnel project resulted in Ultra-Poly, a Pennsylvania recycler, wanting to recycle greenhouse film in large volumes. North Fork Nursery was able to collect ~50,000 lbs. of used film from 300 greenhouses. They had not shipped to market as of March 2016 but were offered 9 cents per pound picked up at the farm.

Tompkins County

SWCD had held the cooperator agreement for the baler but did not renew it in 2015. The arrangement with Tompkins County SWCD allowed RAPP to collect and recycle 27,000 lbs. of agricultural plastics regionally, all material going to NBF Plastics.

Washington County

SWCD had opted out of the program in 2014. Privatizing their solid waste management and a high percent contamination in collected plastic Contributed to the balers transfer to Chautauqua County in 2015. Washington County's final shipment to market consisted of 55 bales.

Wyoming County

Participants: Wyoming County CCE has the baler cooperator agreement and does the recruiting. They are active in Genesee, Livingston and Wyoming counties, with their total participation being over 60 farms.

Plastic Activities: In October of 2015, ~42,776 lbs. of agricultural plastics shipped from the Wyoming County program for recycling. Approximately 40,000 lbs. of plastic was baled. This leaves 90,000 lbs. of material from approximately 30 farms and two dry bean businesses ready for market.

Logistics of moving bales from farms to a central location remained challenging. Most of the bales were silage cover, but there was also bale wrap and bulk bags. Wyoming CCE shipped 41.5 tons of agricultural plastics to market. The county exceeded a 50% recycling rate from the county's dairy industry, which is well above the national recycling rate for all plastics (9%).

Wyoming still has a baler, it is just sitting in their town highway department and likely needs to be serviced. They are interested in getting rid of their baler, especially due to the lack of markets, and to free up the space at their county highway department. A local feed mill and a local dairy farm are both interested in purchasing the baler, to bale their own and potentially neighbor's plastics, and continue the search for markets. However, the contracts with the DEC have made this difficult to facilitate. Wyoming County used to take the baler to farms and bale on site. This was a difficult and time consuming process, but they have no solid waste division at the county, so it was the only option. Their waste management is through a contract with Waste Management Incorporated, who picks up garbage from farm's dumpsters, and household garbage from the curb. Farms likely would have been willing to drop the plastic to a central site for baling, but no one in the county was willing to step up and get a site permitted.

Wyoming had been generating 2-3 tractor loads per year, and could currently create more if there was a market for reinforced plastics. However, given the lack of any market, it is all going into the dumpsters and making its way to the landfills, taking up valuable space. Farms still have 20 bales of reinforced plastic just sitting around for this reason, and the highway department is

home to 15-20 more. Farmers in the county continue to call and ask about RAPP, as they are interested in participating in agricultural plastic recycling, but the county cannot afford to start up their own efforts without being able to turn a profit. They have tried to contact Waste Management Inc. about a partnership with no success. Occasionally companies or individuals will approach the county about removing their existing bales, but they charge \$12-28 hundred dollars, and this is unaffordable.

CHALLENGES

Industry changes varied around New York State. This program began with startup funding from New York Farm Viability Institute (NYFVI) and the commitment from NYS DEC to provide plastic balers around the state. However, as time went on market pressure and loss of funding caused the Cornell portion of the program to shut down. Without funds it has been impossible to continue with the program.

Despite this, we felt obligated to continue the county programs as best as we could, even without the funding from the DEC grant. With many loose ends - From communication/meeting among the SWCD/Cooperative Extension/Farmers, distribution of balers and supplies, etc. - it was difficult to neatly wrap up the program. The counties involved included: Wyoming, Lewis, Clinton, Franklin, Jefferson, St Lawrence, Delaware, Tompkins, Cattaraugus, Chautauqua, Otsego, Madison, Westchester, and Long Island.

The balers are owned by NYSDEC and will stay under contract in their current locations unless the county/entity does not want to use the baler any longer and the

DEC approves their move. As it stands, Wyoming County would like to sell theirs to a local farm, Lewis County wants to get rid of theirs, and Allegany County would like to acquire one. However, the legal issues with the DEC, as well as communication blocks to the agency make this process lengthy and difficult to facilitate.

At the ending of RAPP, meetings with recyclers led to very mixed results. Great Lakes Recycling, North Tonawanda, was handling film plastics and would assist with marketing and possibly facilitating pickup of baled plastics from farms in Western NY. Ultra-Poly, a plastics recycling company in Pennsylvania, ran test runs to process greenhouse films with coordination from RAPP. This went well and they subsequently started accepting and processing this material. However, this is no longer in operation.

The lack of real, lasting markets for dirty plastic is the downfall of the success RAPP or any future similar program. Many entities have tried and failed to turn this material into products that could be beneficial and useful. For 20 years heavy hitters, like Mobile, Exxon and Delta, tried to recycle the agricultural plastics, but these efforts have all failed. There was a market in Pennsylvania for fracking pond liners, because it is 60-80 mils thick and washable, but it is unknown if this is still in operation in 2019.

At the end of the program in 2016, one solid market was established in Brooklyn. There was a company producing trash bags, however they received a few bad loads and stopped accepting the agricultural films.

While clean plastics are being readily recycled and accepted, it takes very little contamination to make linear plastics dirty. Additionally, with the China market recently ceasing their acceptance of our recyclables, there is little hope of a solid market developing internationally anytime soon. Those countries which do accept are often burning them. To top it off, the cost of transportation often exceeds the market value.

Furthermore, plastics-to-oil has not succeeded thus far. A plant was built in New Hampshire in the New England Kingdom. They took several loads from NYS for testing, but then never commissioned the plant. This likely occurred due to the low price of oil -time and prices will determine if this changes and such a market can emerge.

Even with available markets, the balers themselves prove problematic. The best experiences have been with stationary balers at solid waste divisions, as the mobile balers provide maintenance, operation, and transportation challenges. The BigFoot 300 balers are an excellent prototype but design flaws contribute to the high maintenance along with wear from use over time. The production rights for these balers have been turned over to Kennco Manufacturing. While they are a valuable tool for recycling agricultural plastics, particularly with larger quantities of plastic, use is difficult.

Whenever possible, the primary mode of agricultural plastics collection and baling should be through established Solid Waste Management infrastructure, not on-farm baling. Traditional stationary balers are generally more versatile and robust in handling a large range of materials. This

requires each county to have Solid Waste Infrastructure, which presents issues with space and zoning, as well as cost, if the facility is not already in place. Without such a facility, counties would have to send their plastics to be baled elsewhere, and if the plastic has not been properly cleaned, this gives further opportunity for the growth of mosquitos, additional water to accumulate, and general muck to get harder and more caked on. Success has been found from folding the plastics and putting them in plastic Super Sack[®], then depositing them at specific drop sites.

- 40,000 pounds was sent to JUM Global from Madison County for plastics-to-fuel efforts.
- 120,000 lbs. were sent to Prima-America in Groveton, NH, for plastics-to-fuel processing. However, after this plant was tested it ended up shutting down.
- 110,600 pounds were shipped to other markets.
- 336,000+ pounds have been diverted and baled in preparation for market, but were still awaiting shipment at the program's end.

FINAL RAPP NUMBERS

Summary of Shipments in Pounds of Plastic Diverted:

9/13-5/14	225,000
6/14-11/14	656,100
12/14-8/15	600,131

- Over 2,000,000 pounds of agricultural plastics from NY farms diverted to markets.
- 815,631 pounds were sent to Brooklyn, NY, for processing into garbage bags, and an 82,600 pounds were forwarded by NBF Plastics in Auburn, NY.
- 157,000 pounds of mulch film was shipped to Delta Plastics in Little Rock, AR, to be made into industrial quality garbage bags.
- 279,500 pounds were delivered to NBF for processing into plastic lumber.
- 11,000 lbs. of Super Sacks[®] were taken by NBF for reuse.
- 156,000 pounds were taken by TAP Industries, in Malone, NY, with the intent processing it into plastic pellets. To date the plastic bales are stored at TAP.

CONCLUSION

As many markets for recycled agricultural plastics collapsed during the program's operation, agricultural plastic recycling has virtually ceased in all counties post-RAPP. Without RAPP's funding, counties do not have the time, resources, money, or staff to fund a program, especially without markets. While some counties continue small operations and are searching for markets, they have not found a way to make the practice of agricultural plastics recycling profitable, instead having to accept situations of zero-sum, or even a loss. Still other counties have the capacity to bale, but the baled agricultural plastics have nowhere for to go. Instead of being recycled, they take up space in local extension offices, highway offices, and waste management facilities. As it stands, most counties are sending agricultural plastics to landfills.

Prior to the program's completion, a total of 2,025,131 pounds of plastic were diverted. This total includes 336,000 lbs. of baled material that were ready for market upon the programs completion.

Upon conclusion of RAPP, markets for agricultural plastics had dried up. NYS agricultural plastics recycling has mostly ceased, with just a few county's continuing their efforts. However, even county's that still bale are struggling to store and market the material. Attempts, efforts, education, and outreach is ongoing, but success is limited, slow-going, and frustrating. The general consensus is that county's would like a streamlined process at central

materials recovery facilities, which are better equipped to handle the mass, mess, and process. However, not all counties have access to such a facility, and without a revenue-stream to be gleaned from the process, they cannot pay the transportation fees, or staff the project. Most are playing the "wait and see" game with oil prices and foreign markets, and have been left frustrated on many fronts, despite their best attempts and intentions.