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USE AND DISPOSAL OF AGRICULTURAL PLASTICS

LOIS LEVITAN, PH.D.
ENVIRONMENTAL RISK ANALYSIS PROGRAM, LEADER
CORNELL UNIVERSITY DEPARTMENT OF COMMUNICATION
CO-CHAIR CCE "ENVIRONMENTAL HEALTH RISKS IN AGRICULTURAL COMMUNITIES" PROGRAM WORK TEAM

My comments focus on the increasingly ubiquitous use of plastics in agriculture. Plastics are now used on dairies for silage bags, bunker silo covers, bale wraps and twines; in nurseries and ornamental horticulture as greenhouse covers, seedling trays and plant containers; in fruit and vegetable production for row covers and mulch films; and in all sectors of agriculture for pesticide containers.

This testimony is based on research conducted last year into uses and off-farm disposal options for agricultural plastics, and on current research to evaluate the technical and economic feasibility of recycling dairy plastics in Upstate New York. The earlier research is summarized in the report *Recycling Agricultural Plastics in New York State.*[1] The current research is not yet published.

I became involved in this work as a member of the "Cornell Open Burning group," which formed in 2002 to assess the extent and environmental health significance of open burning of household wastes and agricultural plastics in New York State, and begin work towards reducing these practices in order to protect public health and the environment. We decided to focus on disposal of agricultural plastics, rather than on the household waste stream, for reasons that include the importance of agriculture in New York and the role of Cornell's College of Agriculture and Life Sciences (CALS) in working with New York State agriculture and the environment. The objective of our work is to facilitate development of an infrastructure in New York State for disposing of plastics off-farm rather than burning, burying or dumping the materials on the farm.

Despite considerable visual evidence that use of plastics in New York State agriculture is on a steep rise, hard numbers on quantities used and means of disposal are poorly known.

We do know that plastics are increasingly substituted for the longer lasting materials used in the past because of greater production efficiency, lower short term costs, and safety factors.[2] At least some of the economic advantages accrue particularly to small farmers and those whose future in farming is uncertain, because the disposable plastic products do not require a large capital

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[1] Lois Levitan and Ana Barros. March 11, 2003 (Revised). ERAP 03-001. Cornell University, Environmental Risk Analysis Program: Ithaca, New York. 30 pages. Access via ERAP's *Recycling Agricultural Plastics* website, where a large body of other information about agricultural plastics recycling is also made available: <http://environmentalrisk.cornell.edu/C&ER/PlasticsDisposal/AgPlasticsRecycling/>.

[2] E.g., plastic silage bags are used in place of concrete silos, plastic hoophouses in place of glass greenhouses.

investment. Within the past decade or so, these factors have most dramatically been at play in dairy farming, where use of polyethylene plastic films to wrap silage is changing the face of the rural landscape and rendering the familiar silo tower obsolete.

However, these dairy plastics pose particular challenges for off-farm disposal because—not only are they dispersed across the rural landscape, as are other farm plastics—they are bulky and oftentimes contaminated with agricultural debris (*e.g.,* dirt, pebbles, vegetation, moisture, baling twine), which limits suitability and value for reprocessing.[3] Thus these plastics have been difficult to move through existing recycling channels, for which clean, compacted, and collected materials are sought.

In addition, farmers have had little incentive in New York State to expend effort for off-farm disposal. The costs to a farmer for collecting, compressing, transporting and processing used plastics off-farm (so they can be recycled, re-used or landfilled) have been higher than costs for burning, burying or dumping on the farm.

It is estimated — on the basis of two informal studies done about 10 years ago in Pennsylvania and New York — that more than half of agricultural plastics are disposed by burning on-farm, with most of the remainder buried or dumped on-the-farm.

This is of concern because open combustion is a fire hazard and—pound per pound—releases magnitudes of order more polluting emissions than controlled incineration of municipal solid waste (MSW).[4] There is strong evidence of a growing disparity in emissions levels between the two burn methods since more rigorous emissions standards have been applied to MSW incineration.[5]

Most recycling analysts contacted in the course of our research believe that a favorable policy climate and integrated package of incentives and constraints is needed to change the status quo and make off-farm disposal the norm. Recycling coordinators from other states and Canada do not find that market economics currently provides sufficient incentive or stimulus for agricultural plastics recycling programs to succeed. They have found that farmers are more likely to participate in recycling if they are:

- provided technical assistance (*e.g.*, collection infrastructure and support)
- constrained from using cheaper and easier on-farm disposal options by prohibitions against burning and/or dumping

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[3] For example, the TREX company, which makes lumber from a 50-50 composite of waste plastic and waste wood, pays less than 20% for "contaminated" plastics requiring pre-cleaning as for clean film wrap.

[4] While emissions data are highly variable because of differences in burn conditions, the quality of incinerators, data quality and collection methods, an early 1990s study cited in Lemieux 1997 (p2) reported 20 times as much dioxin, 40 times as much particulate matter and many times more metal emissions from open burning. (Lemieux, Paul M. 1997. *Evaluation of Emissions from the Open burning of Household Waste in Barrels*. US EPA. EPA-600/R-97-134a. 79 pp. (Accessed from <http://www.epa.gov/ttn/catc/dir1/barlbrn1.pdf>).

[5] This has been particularly true since 1995 when maximum achievable control technology (MCT) standards were put in place. Thus, according to the US EPA Office of Air Quality Planning and Standards, emissions of dioxins and furans decreased about 99% and heavy metals, by more than 90% from 66 large municipal waste combustors between 1990-2000 (cited in Environment Reporter 33(26):1429. 6-28-02).

- swayed from putting materials into landfills because of significantly higher tipping fees for solid waste than recyclables.

The agriculture plastics recycling coordinators in New Jersey—where open burning of farm plastics is prohibited—have noted that New Jersey farmers will travel up to 45 minutes to deliver recyclable film. They will pay the $10-$20 per ton tipping fee for recyclables, which is substantially less that the current $60 per ton landfill tipping fee for solid waste. In comparison, a Pennsylvania survey indicates that growers there—where open burning is legal—would not travel more than 20 minutes to a recycling facility.[6]

Despite the technical, behavioral, regulatory and economic hurdles, successful programs for recycling various agricultural plastic resins have been developed in neighboring states and Canadian Provinces. For similar success in New York State, several analysts have suggested the need for one or more "champions" within a state government agency or an organization such as Cooperative Extension to facilitate meshing of the needed elements of invention, entrepreneurialism, research, farm relations, and policy.

Elements needed for an effective program include:

- Research on *(i)* the quantities of plastics used in various sectors of New York State agriculture, *(ii)* their sources and specifications, and *(iii)* cost to farmers for their use and disposal. (Cost estimate: $10,000-$20,000)
- Coordination between agricultural plastic product manufacturers and the re-processing sector to mesh specifications in product design with the parameters required for recycling and reprocessing.[7]
- Development of an infrastructure for collection and transport of used materials. Such an infrastructure is a crucial preparatory step for an efficient recycling system because a sufficient stream of materials must be guaranteed before recycling markets can be developed.

While the development of efficient processes and equipment for recycling agricultural plastics is likely to be an ongoing challenge,[8] I believe that a coordinator(s) working at 0.5-1.0 FTE for two years (and at a lesser FTE subsequently) interacting and coordinating with potential players, stimulating and overseeing research elements, and laying groundwork for collections infrastructure could have a tremendous impact in establishing a set of programs for agricultural plastics recycling in New York State that would greatly reduce the current comparative advantage of burning and dumping waste materials on-farm.

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[6] Personal communication, Karen Kritz, NJDA, Sept 4, 2002, Feb 18 and Sept 24, 2003.

[7] For example, silage bags are now of a color that cannot be used by some plastic lumber manufacturers.

[8] For example, processes to reduce and remove accumulated debris (e.g., by washing, agitation, or chemical action) are being developed by several waste haulers and re-processors, as are re-processing systems that can better handle plastics contaminated with soil, moisture, pesticides, vegetation, etc. Current research at the Pennsylvania State University is investigating methods for densifying the highly contaminated agricultural plastic films that are not suitable for recycling, in order to use them as feedstock for combustion in boilers for energy recovery.