

EXPERIMENTAL INVESTIGATION OF AGRICULTURAL PLASTIC WASTES QUALITY CHARACTERISTICS REGARDING RECYCLING AND ENERGY RECOVERY

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Abstract

A holistic environmentally sound waste management scheme that minimizes costs and maximizes revenues by transforming agricultural plastic waste (APW) streams into labelled guaranteed quality commodities freely traded in open market has been developed by the European research project *LabelAgriWaste* project. The main objective of the project was the development of a European system of technical specifications, legal framework and economical scheme for collection, selection, consolidation, compaction, characterization and labelling of APW and their final exploitation for recycling or for energy recovery, if non-recyclable.

The *LabelAgriWaste* scheme standardizes the APW quality through the definition of technical specifications for each final disposal option. According to these requirements it proceeds to labelling. Virgin agricultural plastic should be able to meet the specifications set through a thorough analysis of the recycling and energy recovery industry. If yes, the question is what can prevent the APW from meeting the specs.

Virgin AP samples were collected and analysed according to the recycling and energy recovery specs in order to define if the commercial AP are recyclable and what can prevent their recyclability. Then, the APW was traced through the different phases from its use to the final collection by sampling and analysing the APW and attempting to document the history of the APW sampled so as to correlate quality degradation effects to their causes. The APW quality characteristics investigated are the contamination degree, deterioration of mechanical properties and alteration of the chemical composition during the use of the plastic products in the fields and the storage of the plastic waste.

APW samples were collected from various locations in Europe before, after their use and after their storage and transportation to the processing units and their quality characteristics were tested. The analysis of these samples produced a first comprehensive compositional mapping of commercial AP and APW through Europe.

According to the experimental investigation results, the majority of agricultural plastic films appear to retain their mechanical properties after the end of their useful lifetime preserving a “very good quality” for recycling, except for mulching films. Long storage duration causes further mechanical degradation.

The degree of soil contamination of APW samples was found to fluctuate depending on the application. The soil contamination fluctuation is higher in the case of mulching films.

The chlorine and heavy metal content of the tested APW materials was found to be much lower than the maximum acceptable limits for their potential use for the energy recovery in cement industries.