GUATEMALA

I have been reading an article about the Las Vacas river in Guatemala, which has become choked with plastic waste, despite the efforts of the Government to persuade the people not to litter.

Perhaps one day the Government will succeed, but until then they need to insist that all the short-life plastic made in or imported into Guatemala is made with a d2w masterbatch. It will then quickly degrade and biodegrade, leaving no macroplastics or microplastics in the river.

The same problem is apparent all over South America, Africa and Asia, and requires the same solution.

D2w MULCH FILMS –BANGOR UNIVERSITY

I am often asked to comment on papers purporting to show that oxo-biodegradable technology does not work, or creates microplastics. These papers look impressive, and have many citations, but Symphony's scientists always find fundamental errors. We have now seen another one which is so amateurish that I am surprised it was allowed to be published.

This one is from Bangor University, called "Size-dependent effects of oxo-degradable plastic contamination on soil quality and the growth of Zea mays. Front. Agr. Sci. Eng., 2026, 13(1): 25623 https://doi.org/10.15302/J-FASE-2025623" It purports to show that d2w biodegradable plastic (which they incorrectly call oxo-degradable plastic) is not suitable for agricultural mulch film, but it shows nothing of the kind. The problem is that faulty research is often cited in literature-reviews and leads policymakers to make the wrong decisions.

We often find that academics do not understand that d2w biodegradable plastic is not designed to start biodegrading immediately. It has a predetermined service-life during which it can be re-used and recycled, and only after a period of abiotic degradation will it become biodegradable.

We often find that researchers (a) have not followed any Standard test method (b) have followed the wrong standard eg ASTM D6400 or EN13432 (c) have no idea whether the test sample contains a masterbatch formulated for the particular application, and included at the correct concentration or at all (d) did not continue important parts of the test for a sufficient length of time (e) used a sample so stabilised that it would take a very long time before the material became biodegradable (f) exposed the plastic under conditions unlikely to be experienced by the product in the use for which it is designed.

I thought it rather odd that the authors of the Bangor paper should be claiming that d2w biodegradable plastic is not suitable for agricultural mulch film - because this type of plastic has been successfully used for that purpose for more than 40 years.

The authors are correct that "accumulation of plastic residues in agricultural soils has become a major environmental concern and is now ranked as one of the world's top ten environmental threats due to the impact on soil health, water quality and biodiversity." That is the reason why d2w biodegradable mulch films were invented.

At page 47 of "Degradable Polymers, Principles and Applications" (1995 - ISBN 1-4020-0790-6) Professor Gerald Scott says "The products formed by biodegradation are of benefit to the agricultural environment as biomass, and ultimately in the form of humus. Carbon is retained in the soil during biodegradation in a form accessible to growing plants, rather than by being emitted to the environment as carbon dioxide, as is the case with hydro-biodegradable polymers (e.g. pure cellulose and starch) ..... Time control of biodegradation of the synthetic carbon-chain polymers is achieved by antioxidants." See also "Polymers and the Environment" (1999 - ISBN 10: 0-85404-578-3) pages 109-118 and www.biodeg.org/wp-content/uploads/2023/07/Scott-Wiles-paper-June-2001.pdf

With regard to the paper from Bangor University:

(c) and (e) It is not known exactly what they tested. Mulch films are usually thin (5 – 15 microns), but in view of the thickness of the sample used (31.3 microns) it was probably from a garbage sack, which in addition to being thicker, would have been formulated to degrade over a much longer period than a mulching film. It also contained a black pigment which would hinder the effect of uv light. The remainder of this paper has therefore no relevance to a properly formulated d2w mulching film. There are other errors:

(d) and (f) a d2w biodegradable mulch film is intended to lie on the surface of the field, exposed to sunlight, oxygen and heat for several months while the crop is growing. There is no "one-size-fits-all" as the film is formulated to degrade according to the timescale for the particular crop in the particular climatic conditions, by carefully balancing the active ingredients and stabilisers in the film formulation.

While the film is lying on the fields, a process of oxidation occurs, and by the time that the crop is harvested the molecular structure of the film has changed and it has become biodegradable. It no longer has any need for sunlight or oxygen, and can be ploughed into the soil, where it will be a nutrient for bacteria living there, and a source of carbon for next year's plants. It will not accumulate as macroplastics or microplastics in the soil.

The farmer has therefore no need to drag hundreds of square metres of plastic off the fields and dispose of it. If ordinary plastic had been used, much of it would have fragmented under the influence of sunlight and/or heat, and

microplastics would have been scattered on the field by the wind and/or by the process of removal.

The authors found that "oxidative degradation of the polymer had not progressed sufficiently to form ketones, aldehydes or carboxylic acids, and they say "This is likely attributed to the lack of prior UV exposure, as UV irradiance is key to the oxidation process of ODPs, and its absence or limited exposure would significantly reduce the rate of oxidation." – Correct - so why design a study which omits this crucial step?

The authors say "Our experimental design, while potentially underestimating the degradability of ODPs exposed on the soil surface, was designed to determine their ecological impacts where UV exposure can be limited (e.g., under the plant canopy) or absent (i.e., buried in the soil)."

However, a d2w mulch film will typically be laid on the fields before there is any "plant canopy" and it will be weeks or months before a canopy has developed which would significantly affect the access of uv light, during which time the film would have had sufficient exposure to uv light and/or heat for abiotic degradation to commence. One commenced it is unstoppable.

In fact their experiment seriously underestimated the degradability of films exposed on the soil surface, and seems to have been designed so that the study would fail. They simply took a thick piece of "black-coloured d2w biodegradable plastic," milled it into small pieces and mixed them up with soil with very limited exposure to oxygen or uv light. They then waited six weeks to see whether they could observe any degradation, and as would be expected they found very little.

CONCLUSION

For all the reasons mentioned above this study cannot be relied on by anyone wishing to know how a d2w mulch film would perform on the fields. The analysis in this paper of the effect of macroplastics and microplastic on the soil and plants is therefore essentially about the effect of non-degradable conventional plastics, not d2w biodegradable plastics.

One of the authors, Davey Jones, is reported as saying: "Oxo-degradable plastic should not be used in 'eco-friendly' product lines unless it can be guaranteed that the products can be collected and reprocessed." This statement is not supported by the research, and it shows a misunderstanding of the purpose of this type of plastic. This technology is not necessary if the products are collected and reprocessed – its purpose is to ensure that products which do NOT

get collected will not create microplastics and lie or float around in the environment for decades.