



OXO-BIODEGRADABLE PLASTICS ASSOCIATION

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WHY BIO-BASED IS THE WRONG TECHNOLOGY

There are two distinct types of biodegradable plastic. They are:

- “Compostable” - (also loosely known as “bio-based plastics” or “bioplastics”) and designed according to EN13432 or ASTM D6400 to biodegrade in the special conditions found in industrial composting or anaerobic digestion, and
- Oxo-biodegradable - made from polymers such as PE and PP, containing extra ingredients (which do not include “heavy-metals”) designed according to ASTM D6954 or BS8472 to degrade and biodegrade in the open environment leaving no harmful residues.

We should all stop using the generic term “biodegradable plastic” - as this causes confusion.

In February 2011 the UK Environment Agency published a Life-cycle Assessment¹ which showed that ordinary plastic bags have a better LCA than paper or bio-based “compostable” bags. The report also highlighted that conventional HDPE plastic bags are, for each use, almost 200 times less damaging to the climate than cotton hold-alls favoured by environmentalists, and have less than one third of the CO₂ emissions of paper bags.

In March 2012 Intertek wrote another report² which put the environmental credentials of oxo-biodegradable plastic ahead of conventional and “compostable” plastic.

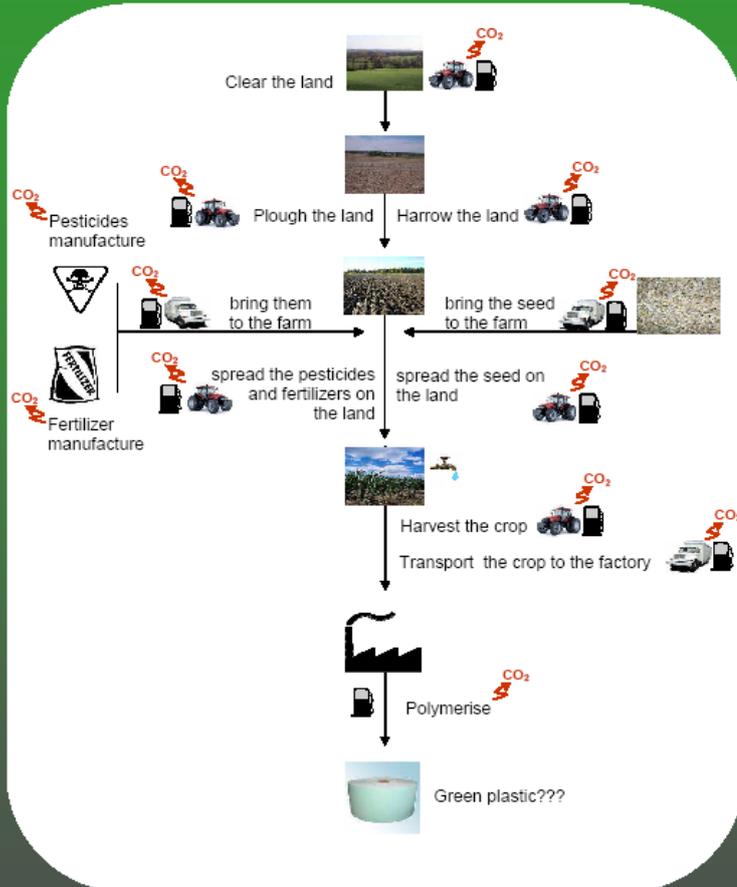
Bio-based plastics are not “renewable” because the process of making them from crops is a significant user of non-renewable fossil-fuel energy and a producer therefore of greenhouse gases. Fossil fuels are burned by the agricultural machinery and road vehicles employed; also by the manufacture and transport of fertilisers and pesticides. Electrical energy, derived often from fossil fuel, is consumed by the autoclaves which ferment and polymerise material synthesised from biochemically produced intermediates (e.g. polylactic acid from carbohydrates etc).

Some bio-based plastics have high starch content and it is sometimes said that this justifies the claim that they are made from renewable resources. However, many of them contain up to 70% of synthetic plastic derived from oil, and others (e.g. some aliphatic polyesters) are entirely based on oil-derived intermediates. Genetically-modified crops may also have been used in the manufacture of hydro-biodegradable plastics.

¹ http://degradable.net/files/uploaded/Carrier_Bags_Report_EA.pdf

² [http://www.biodeg.org/files/uploaded/Intertek_Final_Report_15.5.12\(9\).pdf](http://www.biodeg.org/files/uploaded/Intertek_Final_Report_15.5.12(9).pdf)

Hydro-biodegradable Plastic Production Process



How much fuel has been burned ?
Is it really renewable?
Is it really green?

By contrast, conventional plastics, and oxo-biodegradable plastics, are made from a by-product of oil refining which used to be wasted, and the same amount of oil would be extracted (to make fuels) even if plastics did not exist.

Bio-based “compostable” plastic:

1. is designed to be taken to an industrial composting factory, of which there are very few, and to biodegrade in the special conditions found in the industrial composting process. It does not therefore address the problem of plastic litter in the open environment.
2. is too expensive for everyday use – costing up to 400% more than ordinary plastic. Even if this cost were substantially reduced in the future it is far too expensive for ordinary people.
3. is not compostable and it is misleading to so describe it. When something is described as compostable an ordinary consumer would think that it can be converted into compost, but the Standards for this type of plastic (ASTM D6400, EN13432 etc.) require it to convert into CO₂ gas within 180 days. You cannot therefore make compost from it – only greenhouse gas. This

process contributes to climate change but does nothing for the soil, and it cannot be described as recycling.

4. The Federal Trade Commission of the USA has said³ that it is not sufficient to show that a test item had complied with ASTM D6400 or D6868 [or EN13432 or the ISO equivalents]. The Commission found that those standards “likely do not typify compost facility operations nationwide. Rather they reflect “optimum [operating] conditions and ignore wide variation in actual facility operations. Because of these variations, the test protocols likely do not replicate typical compost facility environments. Therefore, consumers whose local facility [if they have one at all] operates differently than the ASTM’s assumptions would be deceived if the item were incapable of being composted.”
5. is not suitable for home composting.
6. should not be described as “biodegradable” because it will fragment in the open environment but is tested for biodegradation (according to EN13432 or ASTM D6400 and equivalent standards) only in the special conditions found in industrial composting or anaerobic digestion.
7. is not really suitable for shopper bags because they need to be strong and to be capable of re-use many times before final disposal.
8. cannot be made by plastics factories with their existing machinery and workforce.
9. is not "renewable." See above.
10. can generate methane deep in landfill. This is a greenhouse gas much more powerful than CO₂. Oxo-biodegradable plastic does not degrade deep in landfill and does not therefore generate methane.
11. It is not desirable to use land and water resources to grow crops to make plastic. Those resources should be used to produce food for the many people in the world who do not have enough to eat. The European Parliament⁴ has resolved not to encourage the use of land and water resources for producing bio-fuels (and the same reasoning applies to bio-plastics). The UN issued a report to the same effect on 31st March 2014.
12. There is in any event not nearly enough arable land and water to grow crops to make enough bio-based plastic to replace ordinary plastic, even for shopping bags.
13. It is sometimes claimed that the growing crops absorb CO₂ but that would be true of the vegetation that was there before.
14. Bio-based “compostable” plastic is not really suitable for agricultural mulch films, because the degradation time cannot be controlled in line with the growing cycle.⁵
15. It cannot be recycled with ordinary plastics,⁶ so anyone who is in favour of recycling should be against it. By contrast oxo-biodegradable plastic can be recycled if collected during its useful life.⁷
16. It is generally thicker and heavier, so it needs more trucks to transport it, using more road space, consuming more fuel, and emitting more CO₂ and other forms of pollution to atmosphere.
17. Bio-based “compostable” plastic will not comply with the laws of the United Arab Emirates, Pakistan, and other countries which require all short-life

³ P114 of its Green Guides Review <http://www.ftc.gov/os/fedreg/2012/10/greenguidesstatement.pdf>

⁴ (P7_TA-PROV(2013)0357)

⁵ Oxo-biodegradable plastics can be controlled by adjusting the formulation of the additive

⁶ http://www.biodeg.org/files/uploaded/biodeg/executive_summary/Roediger%20on%20TCKT%20Rept%205%20Dec%20'13.pdf

⁷ http://www.biodeg.org/files/uploaded/biodeg/executive_summary/Roediger%20on%20TCKT%20Rept%205%20Dec%20'13.pdf

plastic goods and packaging exported to those countries to be oxo-biodegradable.

On 18th July 2008 Dr Caroline Jackson MEP⁸ issued a press statement as follows:

"the European Parliament is concerned by the use of scarce land and water resources around the world to produce biofuels in competition with food-crops and the same concern applies to growing crops to make biodegradable plastics, so I hope the European Commission will give more positive support to oxo-bio plastics."

In June 2009 a study was published⁹ by Germany's Institute for Energy and Environmental Research (IFEU), which concluded that "The current bags made from bioplastics have less favourable environmental impact profiles than the other materials examined" and that this is due to the process of raw-material production.

In March 2014 the Deutsch Umwelthilfe published a letter¹⁰ to the EU Environment Commissioner in which they explained with reasons why bio-based bags have no significant advantages in comparison to conventional polyethylene plastic bags.

Residues from some native starches can be seriously toxic; bitter cassava for example (tapioca) has a high level of hydro-cyanic glucoside present, which has to be removed by careful washing. During growth the plant is toxic to wildlife. Cassava is exhaustive of potash¹¹.

Many articles in the international press have drawn attention to the danger of using "renewable" resources derived from plants as a substitute for petroleum products. They focus on the use of corn and palm oil to make "biofuels" for motor vehicles, but the same danger arises from the use of corn and other agricultural products to make hydro-biodegradable plastics.

The Charity "Actionaid" is campaigning against the use of land and water resources to produce bio-fuels¹² They say "Biofuels are causing hunger:

- **by pushing up food prices** - burning huge amounts of food in our cars reduces the amount available to eat, causing global food prices to rocket.
- **by fuelling land grabs** - people are forced off their land to make way for biofuels plantations, leaving them unable to grow food to feed themselves or to sell.
- Despite originally being promoted as a solution to climate change, there's now scientific consensus that most biofuels are worse for the planet than fossil fuels."

The International Herald Tribune wrote on 31st January 2007 "*Just a few years ago politicians and green groups in the Netherlands were thrilled by the country's adoption of "sustainable energy" by coaxing electricity plants to use biofuel.*

⁸ Dr. Jackson was Chairman of the Environment, Public Health, and Food Safety Committee of the European Parliament, and was the Rapporteur for the EU Waste Framework Directive. See also www.packagingnews.co.uk/News/833174/MEP-Jackson-calls-EC-support-hydro-oxo-biodegradable-plastics/
⁹ (<http://www.kunststoffverpackungen.de/en/news/LCA%20waste%20bags%20-%20Study%20Extract%20B.pdf>)

¹⁰ <http://www.biodeg.org/files/uploaded/German%20ltr%20to%20Potocnik%203.3.14.pdf>

¹¹ Pyxis CSB "Comparative Life Cycle Analyses for a variety of Degradable Food Packaging Materials" June 2007

¹² <http://www.actionaid.org.uk/food-not-fuel>

Spurred by government subsidies, energy companies designed generators that ran exclusively on this fuel, which in theory would be cleaner than fossil fuels because it is derived from plants.

But last year, when scientists studied plantations in Indonesia and Malaysia, this **green fairy-tale began to look more like an environmental nightmare**. Rising demand for palm oil in Europe caused the razing of huge tracts of southeast Asian rain forests, and the over-use of chemical fertilisers there. Worse still, space for the plantations was often created by draining and burning peat land, which sent huge carbon emissions into the atmosphere.

In Mexico on 25th January the **financial newspaper “24 ORE”** asked “Food or fuel? Is maize better on the table as tortillas or in the tanks of cars, converted into ethanol and then bio-fuel? The price of the cereal has doubled in a year because of the high demand for ethanol obtained from maize to produce bio-fuels. It has created a real food crisis because the price of tortillas has increased greatly. They used to cost seven pesos per kilo but now exceed 18 pesos. Tortillas are the basic element of the Mexican diet.

According to the Earth Policy Institute, “The trade off between food and fuel risks creating chaos in the world market of food products” and they predict that **shortages and higher food prices will lead to starvation and urban riots**

Business Week 5 Feb 2007 edition “The rise in the price of corn that's hurting US pig farmers isn't caused by any big dip in the overall supply. In the U.S., last year's harvest was 10.5 billion bushels, the third-largest crop ever. But instead of going into the mouths of pigs or cattle or people, an increasing slice is being transformed into fuel for cars. The roughly 5 billion gallons of ethanol made in 2006 by 112 U.S. plants consumed nearly one-fifth of the corn crop.” US chicken producers are also being hit. The industry's feed costs are already up \$1.5 billion per year. Ultimately, these increases will be passed on to consumers, and there could be dramatic inflation in food costs.

The UK House of Commons Environmental Audit Committee found¹³ that “**the stimulation of biofuels production by the [UK] Government and EU is reckless in the absence of effective mechanisms to prevent the destruction of carbon sinks internationally**”

The Committee continued¹⁴ “**A large biofuel industry based on current technology is likely to increase agricultural commodity prices and, by displacing food production, could damage food security in developing countries.**”

The use of biofuels in the EU has come under assault once again, this time from the European Commission's own scientific institute, the Joint Research Centre.¹⁵ An unpublished internal report from the research body questions whether the cost of their use is worth the benefits.

The report buttresses worries over biofuels expressed by environment Commissioner Stavros Dimas and research from environmental campaign groups that suggests biofuels may actually contribute to global warming through the deforestation and peat bog burning that is required for biofuel sources such as corn or oil palm trees.

¹³ Report 15th January 2008 (HC 76-1 of 2007-08). Para 53
<http://www.publications.parliament.uk/pa/cm200708/cmselect/cmenvaud/76/76.pdf>

¹⁴ ibid para 63

¹⁵ EU Observer.com 18 Jan 2008

In March 2014 the United Nations published a report¹⁶ on the danger of encouraging the production of biofuels, saying that biofuels can do more harm than good. They said “In part as a result of climate change mitigation policies to promote biofuels and growing concern about food insecurity in middle and high income countries, large-scale land acquisition in Africa, Southeast Asia, and Latin America has displaced small landholders and contributed to food price increases. Poor urban residents are particularly vulnerable to food price increases as they use a large share of their income to purchase food. At the same time, higher food prices may benefit some agricultural self-employed groups. Besides negative impacts on food security, biofuel schemes may also harm poor and marginalized people through declining biodiversity, reduced grazing land, competition for water, and unfavorable shifts in access to and control over resources.”

In February 2011 A report from the University of Arizona¹⁷ warned that synthetic biology will bring us cheaper plastics by ruining the poorest nations on Earth.

On 3rd April 2009¹⁸ Dr. Peter Brabeck, Chairman of Nestlé said “The water issue comes back to three simple things. The first is infrastructure. If you look worldwide it's about 60% of fresh water that we are losing due to insufficient infrastructure. The second is political decisions. **It is absolutely unacceptable that we are using food for biofuels. We need 9,100 litres of water to produce one litre of pure diesel. This is not sustainable.**”

Friends of the Earth Europe said on 9th July 2008¹⁹ **"The political tide in Europe is now turning against biofuels.** This vote [in the European Parliament] gives a clear political signal that an expansion of biofuels is unacceptable." Originally viewed by both European leaders and environmentalists alike as an alternative to fossil fuels, biofuels have in the last year become something of an eco-villain, with countless reports showing how production of the fuel source in fact can result in greater greenhouse gas emissions and is a key cause of skyrocketing food prices.

On 11th September 2013 the European Parliament voted²⁰ to discourage the use of land for producing bio-fuels which could be used for growing crops. The same argument applies to bio-based plastics.

The British Royal Society for the Protection of Birds is also highly critical of using land and water resources for this purpose²¹ “Driven by the thoughtless policies of governments around the world, biofuels production is decimating swathes of important habitat and threatening the survival of many species, including Sumatran tigers, orang utans and countless bird species.

Biofuels advocates justify this destruction by citing their potential for combating climate change. However, whilst biofuels can play a part, many of those on the market today don't deliver the greenhouse gas savings they promise and some are even more polluting than the fossil fuels they're meant to replace.²² There is also evidence that taking land used for growing food, and converting it to growing

¹⁶ IPCC WGII AR5 Chapter 13

¹⁷ http://www.slate.com/articles/technology/future_tense/2011/02/the_sins_of_syn_bio.html

¹⁸ Financial Times http://www.ft.com/cms/s/0/fafa0d4a-1fe5-11de-a1df-00144feabdc0.html?nclick_check=1

¹⁹ <http://euobserver.com/19/26463/?rk=1>

²⁰ P7_TA-PROV(2013)0357

²¹ <http://campaigning.rspb.org.uk/eactivist/user/userJ.jsp?CLS@74YQcNH906cWOsj3K3>

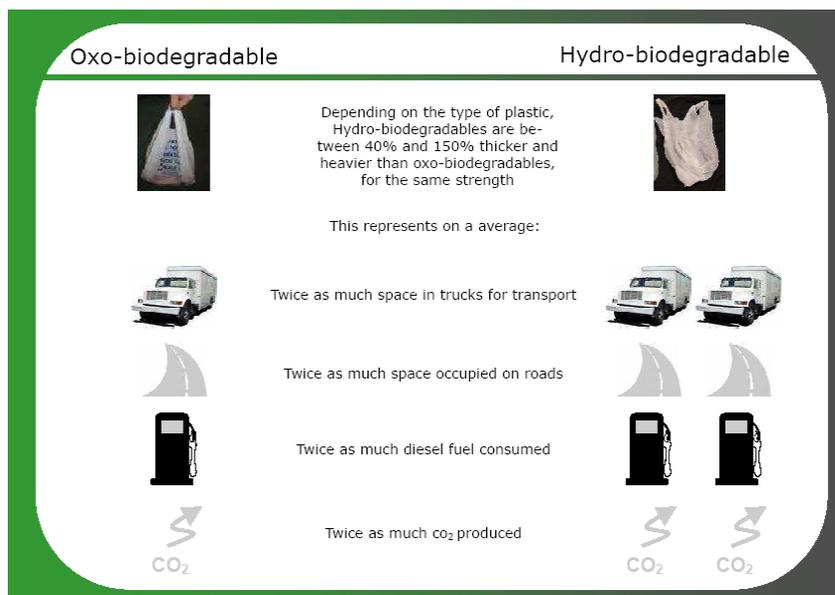
²² Compostable plastics can emit methane, which is a greenhouse gas 23 times more powerful than CO₂

biofuels, is reducing the amount of food produced and contributing to increasing prices.²³

On 6th March 2008 the United Kingdom's Chief Scientific Adviser warned that **if this continues the world will soon be unable to feed itself.**²⁴

As the use of renewable resources for polymer production increases, so does the impact on eutrophication due to the application of fertilisers to the land and run-off of nutrients into waterways.²⁵

See also The Guardian 26th April 2008²⁶



Compostability of plastics is really an irrelevance. The packaging technical manager of Tesco (Britain's largest supermarket) said on 20th October 2009 that the supermarket "does not see the value in packaging that can only be industrially composted" and that "local authorities do not want to touch it, as it can contaminate existing recycling schemes." A few days earlier, Tesco's head of waste and recycling had told a conference that the supermarket group was "not taking compostable packaging any further."

Thick cross-section products, over 150 microns, will usually fail to meet the composting standards.

What is the point of bio-based or "compostable" plastics if they cannot be made into compost (because they are required to convert to CO₂ gas within 180 days), if they should not be sent to landfill (because they can generate methane in anaerobic conditions), if they cannot be recycled with ordinary plastic, if they are not really renewable (because some of them contain oil-derived materials and fossil fuels are used in the agricultural and polymerisation process), if they use scarce land and water resources, and if they are more expensive and less versatile?

²³ See also <http://www.slate.com/id/2283299/>

²⁴ The Times 7th March 2008 <http://www.timesonline.co.uk/tol/news/environment/article3500954.ecce>

²⁵ ExcelPlas (Australia) 2004

²⁶ <http://www.guardian.co.uk/environment/2008/apr/26/waste.pollution?gusrc=rss&feed=networkfront>