



PART 3

Read the text below and answer questions 27–40.

BIOPLASTICS: A SUSTAINABLE SOLUTION OR A GREEN DILEMMA?

A

Bioplastics are commonly described as an environmental upgrade because they are made, at least partly, from renewable biological inputs rather than fossil oil or gas. Yet this framing hides the central difficulty: environmental performance is not a single property that can be “built into” a material. It is an outcome shaped by multiple interacting factors, including the choice of feedstock, the energy used in manufacturing, and, critically, what happens at the end of a product’s life. Confusion persists because two terms that sound similar—biobased and biodegradable—do not mean the same thing. “Biobased” refers to where the carbon comes from, while “biodegradable” refers to whether microbes can break the polymer down under specific conditions. A plastic can be biobased but not biodegradable, and another can be fossil-derived yet biodegradable, so the mere presence of plant carbon is not proof of a “green” solution.

B

The compostability debate illustrates how labels can amplify misunderstanding. Products marketed as “compostable” often meet standards that assume an industrial setting with high heat, carefully controlled moisture, and regular aeration. In practice, many certified compostable materials disintegrate efficiently only in industrial composting facilities, where conditions are engineered to accelerate microbial activity. Domestic compost heaps, by contrast, tend to be cooler and uneven, with fluctuating humidity and oxygen levels. As a result, a fork or bag stamped “compostable” may persist far longer than consumers expect if it is thrown into a backyard pile or, worse, dispersed into the natural environment. The gap between the promise of the label and the reality of available treatment becomes a problem not of chemistry alone but of infrastructure deficit.

C

Even before disposal, the agricultural origin of many bioplastics raises a second dilemma: feedstock competition. When corn, sugarcane, or other crops are grown to supply polymer production, they occupy land that could otherwise produce food or support ecosystems. Expanding acreage can intensify pressure to clear forests or convert grasslands, which releases stored carbon and reduces biodiversity. Moreover, high-yield farming can increase irrigation demand and the application of fertilisers and pesticides. These inputs may boost crop productivity, but they also shift environmental burdens from fossil



extraction to land use and agriculture, with consequences that extend beyond the plastic itself and into water systems, soils, and local communities.

D

What happens after use adds another layer of complexity because existing waste systems were designed around conventional polymers and predictable sorting categories. Many regions lack widespread industrial composting, so biodegradable bioplastics are frequently diverted into landfills or enter mixed recycling streams. In recycling facilities, polymer contamination becomes a practical threat: a small amount of PLA in a PET stream can reduce the quality of the recycled output, because different polymers melt and behave differently during processing. Extra separation steps cost money, and in many sorting lines the technology or staffing required to isolate bioplastics is limited. The result is an uncomfortable paradox: a material promoted as sustainable may undermine mechanical recycling if it is not collected and separated correctly.

E

For this reason, researchers and policymakers increasingly rely on cradle-to-grave analysis rather than marketing claims. Life cycle assessment (LCA) studies attempt to measure impacts across stages such as farming, transport, manufacturing, use, and end-of-life. These assessments often show mixed outcomes: bioplastics can reduce fossil resource depletion and sometimes lower greenhouse-gas emissions at the production stage, especially when renewable energy is used. However, they may perform worse than conventional plastics in categories linked to agriculture, such as eutrophication—water pollution driven by nutrient runoff—and land use intensity. In other words, an apparent climate advantage can be offset by increased pressure on ecosystems or higher nutrient losses to waterways, and the “best” material depends on which impact category is prioritised and how the system boundary is defined.

F

End-of-life conditions are particularly decisive for materials marketed as biodegradable. In an oxygen-rich environment, some bioplastics can break down into simpler compounds over time, but many real-world disposal pathways are oxygen-poor. If biodegradable plastics degrade in anaerobic landfills, they may generate methane, a potent greenhouse gas. This means that a product celebrated as reducing persistent litter could still contribute to warming if it is disposed of in the wrong place. Some landfills capture landfill gas, but capture rates vary, and leakage can undermine the climate benefits claimed upstream. Once again, the environmental outcome depends less on the label and more on the disposal reality.



G

Because these trade-offs are increasingly visible, research efforts are shifting toward feedstocks that lessen land pressure and reduce competition with food systems. Promising pathways include using agricultural waste, algae, or even carbon dioxide captured from the air to supply carbon for polymers. Such inputs could lower the need for dedicated cropland while still producing materials with useful properties. Yet most experts argue that even improved feedstocks do not turn bioplastics into a silver bullet. The most credible sustainability pathway prioritises reducing and reusing plastics wherever possible, supported by clearer labelling, better collection systems, and stronger mechanical recycling. Bioplastics may have value in specific niches—especially where collection is impractical—but only as one tool within a broader shift toward a circular economy.

Questions 27–31

The text has seven paragraphs, **A–G**. Which paragraph contains the following information? Choose the correct letter, **A–G**.

27 The view that environmental outcomes depend on several factors, including disposal.

28 A clarification that two commonly confused terms describe different properties.

29 The explanation that ‘compostable’ items may need controlled industrial facilities to break down efficiently.

30 Evidence that studies can show both benefits and drawbacks depending on the impact category measured.

31 The conclusion that bioplastics should be used as part of a broader strategy rather than as a single solution.

Questions 32–35

Choose **YES** if the statement agrees with the claims of the writer, choose **NO** if the statement contradicts the claims of the writer, or choose **NOT GIVEN** if it is impossible to say what the writer thinks about this.

32 The writer suggests that a plastic can be biodegradable even if it is not biobased.

33 The writer states that home composting conditions are usually sufficient for certified compostable bioplastics.

34 The writer believes that bioplastics made from captured carbon dioxide will become cheaper to produce than crop-based bioplastics.



35 The writer claims that using improved feedstocks would make reducing and reusing plastics unnecessary.

Questions 36–40

Complete the sentences below. Choose **NO MORE THAN TWO WORDS** from the text for each answer.

36 Many compostable bioplastics need the high heat and controlled conditions of an setting.

37 Growing bioplastic feedstocks can increase the use of and pesticides.

38 If biodegradable plastics break down in anaerobic landfills, they may produce

39 One alternative feedstock may be captured from the air.

40 A sustainable pathway prioritises reducing and plastics wherever possible.

Answer Key

27. A

28. A

29. B

30. E

31. G

32. YES

33. NO

34. NOT GIVEN

35. NO

36. industrial

37. fertilisers

38. methane

39. carbon dioxide

40. reusing

