Table 2
Sustainability dimensions and indicators for biobased and biodegradable plastics.

References	Types	Method	Dimensions	Indicators
Mendes and Pedersen [66]	Observation/Document Review	Life cycle assessment	Environmental	Climate Impacts, Recycling, Environmental Effects, Carbon Emissions, Waste Management.
Bishop et al. [67]	Systematic Literature Review	Life cycle assessment	Environmental	Waste Management, Biogenic Carbon Cycling, Carbon Emissions.
Salwa et al. [68]	Observation/Document Review	Life Cycle Assessment	Environmental	Environmental Impacts, Waste Management.
Amasawa et al. [69]	Experiment	Life Cycle Assessment	Environmental	GHG Emissions, End-of-Life Scenarios, Energy Recovery, Waste Management.
Kabir et al. [70],	Literature Review	Life Cycle Assessment	Environmental	Production, Waste Management, Distribution, Use, And Disposal.
Adekomaya et al. [71],	Observation/Document Review	Life Cycle Assessment	Environmental	Saving Fossil Energy and Reducing GHG Emissions, Waste Management.
Spierling et al. [72]	Meta-Analysis	Life Cycle Assessment	Environmental	End-of-Life Assessment, Global Warming Potential, Waste Management.
Walker and Rothman [49],	Literature Review	Life Cycle Assessment	Environmental	Energy Consumption, Carbon Emissions.
Bałdowska-Witos et al. [73],	Meta-Analysis	Life Cycle Assessment	Environmental	Eco-System Integrity, GHG Emissions.
Venkatachalam et al. [74],	Quantitative Survey	Life Cycle Assessment	Environmental	Carbon Emissions, Waste Management.
Beigbeder et al. [75],	Experiment	Life Cycle Assessment	Environmental	End-of-Life, GHG Emissions.
Dilkes-Hoffman et al. [76],	Systematic Literature Review	Life Cycle Assessment	Environmental	Energy Consumption, Carbon Emissions.
Martinho et al. [77],	Quantitative Survey	Survey Questionnaire	Environmental	GHG Emissions, Water Usage, Energy Consumption, Waste Generation.
Pires et al. [78]	Quantitative Survey	Life Cycle Assessment	Environmental	Energy Consumption, Waste Generation.
			Environmental,	Waste management.
Dijkstra et al. [79],	Systematic Literature Review	Triple Bottom Line	Economics	High Costs.
			Social	Society, Product Responsibility, Health and Safety.
Filiciotto and Rothenberg [80],	Meta-Analysis	Material Flow Analysis	Environmental	Climate Change, GHG Emissions.
			Economic	Financial Performance.
			Social	Empowerment, Responsibility to the Community.
Wellenreuther and Wolf [81],	Literature Review	Life Cycle Assessment	Environmental	Environmental Performances, Cost Efficient.
			Economic	Cost, Technical Impact.
Gerassimidou et al. [82],	Systematic Literature Review	Multidimensional Perspective	Environmental	Global Warming Potential.
			Economic,	Financial Impact, Eco-Efficiency
			Social	Participation, Accessibility, Health and Safety.
			Environmental,	End-of-life, Materials, and services
Blanc et al. [83],	Quantitative Survey	LCA, LCC, and ExA	Economic	Transformation, Sale, costs.
			Social	Consumption, Health and Safety
			Environmental	Environmental Management, Pollution, Dangerousness.
Xu, Jiang, and Wu [84],	Systematic Literature Review	Fuzzy Analytical Hierarchy	Economic	Reliability, Responsiveness, Flexibility, Financial Performance.
			Social	Human Rights, Societal Commitment, Customers Issues.

biodegradable items' social, environmental, and economic aspects: commodities manufactured from renewable resources. There are social elements of biodegradable products, biodegradable plastics sustainability indicators, the economic aspects of biodegradable plastics, and the environmental aspects of biodegradable plastics.

However, while there has been substantial study into plastic film, most of it has been on the products' environmental impact. Leceta et al. [86] conducted an environmental evaluation of bio-based films made from agro-industrial by-products and marine leftovers to maximise the value of these wastes. Siracusa et al. [87] used a life cycle assessment technique to assess the environmental harm caused by a bi-layer film bag for food packaging throughout its life cycle from an environmental standpoint. Toniolo et al. [88] utilised the life cycle assessment technique to compare the environmental benefits of two recycled plastic packagings, one of which was recyclable after use and the other which was not. Results showed that using a comparative LCA application was a useful way for determining the extent to which an innovative recyclable package was ecologically superior to an alternative non-recyclable package when comparing two different types of packaging. According to Barlow & Morgan [89], concentrated their attention on packaging in the meat and cheese industries, examining the impact of films and bags, as well as the influence of packaging on the levels of waste and energy consumption elsewhere in the food system.

Regarding promoting packaging sustainability through eco-design tools, Martinho et al. [77] focused on the factors that impacted consumer product purchase and recycling behaviour concerning sustainable packaging. The sustainable variable was environmental awareness, which included purchasing and disposing of items following environmental regulations. Some analyses have concentrated on two aspects: the economic and environmental dimensions, or the environmental and social dimensions, while others have focused on three dimensions. According to Pålsson et al. [90], an assessment model for selecting packaging solutions in supply chains was established from the standpoint of sustainability. The estimates for the environment were based on carbon emissions, and the calculations for the economy were based on expenses. Grönman et al. [91] followed a systematic methodology for sustainable food packaging design that included SWOT analysis and the Life Cycle Assessment approach for evaluating environmental and economic functions. Pires et al. [78] investigated sustainability parameters, which were aggregated using a multi-criteria decision-making technique on two dimensions: environmental aspects connected to life cycle assessment and social aspects related to environmental information on the packaging. They found that the packaging had a positive impact on both environmental aspects and social aspects. Jiuping Xu et al. [84] provide sustainability criteria for plastic film supply chain management based on a triple bottom line approach (economic profit, environmental protection, and social responsibility).

Academic and corporate interest in biodegradable plastics for sustainability has exploded in recent years. This paper assessed biodegradable plastics for sustainability using the TBL technique (economic