

# The Global Market for Bioplastics and Natural Fibers 2023-2033

<https://marketpublishers.com/r/GB60982FAED2EN.html>

Date: September 2022

Pages: 634

Price: US\$ 1,750.00 (Single User License)

ID: GB60982FAED2EN

## Abstracts

Government legislation, consumer trends and environmental concerns are compelling the development of bioplastics and natural fibers in markets including food packaging, automotive, building/construction, textiles, agriculture, sports & leisure and consumer goods. Biocomposites based on these materials offer significant advantages over incumbent synthetic materials including lightweighting, sustainability and reduced carbon footprint. Natural fibers are also abundant and low-cost. The bioplastics and natural fibers market will witness good growth through to 2033, with excellent opportunities for large producers and start ups.

The report provides an in depth analysis of the bioplastics and natural fibers market by applications and bioplastic and natural fiber type. Report contents include:

Market trends and drivers in the bioplastics and natural fibers market.

Production estimates by bioplastics and natural fibers producers, types, market and regions.

Challenges for the bioplastics and natural fibers market.

Advantages and disadvantages of the bioplastics and natural fibers over synthetic plastics.

Analysis of synthetic biopolymers market including Polylactic acid (Bio-PLA), Polyethylene terephthalate (Bio-PET), Polytrimethylene terephthalate (Bio-PTT), Polyethylene furanoate (Bio-PEF), Polyamides (Bio-PA), Poly(butylene adipate-co-terephthalate) (Bio-PBAT), Polybutylene succinate (PBS) and copolymers,

## Polyethylene (Bio-PE), Polypropylene (Bio-PP)

Analysis of naturally produced bio-based polymers including Polyhydroxyalkanoates (PHA), Polysaccharides, Microfibrillated cellulose (MFC), Cellulose nanocrystals, Cellulose nanofibers, Protein-based bioplastics, Algal and fungal.

Analysis of natural fibers including seed fibers (cotton, luffa), bast fibers (jute, hemp, flax, ramie, kenaf), leaf fibers (sisal, abaca). fruit fibers (banana, pineapple, coir), stalk fibers, bamboo, sugarcane, animal proteins, plus alternative wool, leather, silk and down.

Profiles of over 500 companies. Companies profiled include Ananas Anam, BASF, Bast Fiber Technologies Inc., Kelheim Fibres GmbH, BComp, Circular Systems, Evrnu, Natural Fiber Welding, Icytos, NatureWorks, Total Corbion, Danimer Scientific, Novamont, Mitsubishi Chemicals, Indorama, Braskem, Avantium, Borealis, Cathay, Dupont, BASF, Arkema, DuPont, AMSilk GmbH, Notpla, Loliware, Bolt Threads, Ecovative, Kraig Biocraft Laboratories, Spiber and many more.

## Contents

### **1 EXECUTIVE SUMMARY**

#### **1.1 BIOPLASTICS**

- 1.1.1 Market trends
- 1.1.2 Global production to 2033
- 1.1.3 Main producers and global production capacities
  - 1.1.3.1 Producers
  - 1.1.3.2 By biobased and sustainable plastic type
  - 1.1.3.3 By region
- 1.1.4 Global demand for biobased and sustainable plastics 2020-21, by market
- 1.1.5 Challenges for bioplastics in packaging

#### **1.2 NATURAL FIBERS**

- 1.2.1 What are next-gen natural fibers?
- 1.2.2 Benefits of natural fibers over synthetic
- 1.2.3 Markets and applications for next-gen natural fibers
- 1.2.4 Recent commercial activity in next-gen natural fibers
- 1.2.5 Commercially available next-gen natural fiber products
- 1.2.6 Market drivers for next-gen natural fibers
- 1.2.7 Challenges

### **2 RESEARCH METHODOLOGY**

### **3 THE GLOBAL PLASTICS MARKET**

- 3.1 Global production of plastics
- 3.2 The importance of plastic
- 3.3 Issues with plastics use
- 3.4 Policy and regulations
- 3.5 The circular economy
- 3.6 Conventional polymer materials used in packaging
  - 3.6.1 Polyolefins: Polypropylene and polyethylene
  - 3.6.2 PET and other polyester polymers
  - 3.6.3 Renewable and bio-based polymers for packaging
- 3.7 Comparison of synthetic fossil-based and bio-based polymers
- 3.8 End-of-life treatment of bioplastics

### **4 THE GLOBAL BIOPLASTICS MARKET**

- 4.1 Bio-based or renewable plastics
  - 4.1.1 Drop-in bio-based plastics
  - 4.1.2 Novel bio-based plastics
- 4.2 Biodegradable and compostable plastics
  - 4.2.1 Biodegradability
  - 4.2.2 Compostability
- 4.3 Advantages and disadvantages
- 4.4 Types of Bio-based and/or Biodegradable Plastics
- 4.5 Market leaders by biobased and/or biodegradable plastic types
- 4.6 SYNTHETIC BIO-BASED POLYMERS
  - 4.6.1 Polylactic acid (Bio-PLA)
    - 4.6.1.1 Market analysis
    - 4.6.1.2 Producers and production capacities, current and planned
      - 4.6.1.2.1 Lactic acid producers and production capacities
      - 4.6.1.2.2 PLA producers and production capacities
  - 4.6.2 Polyethylene terephthalate (Bio-PET)
    - 4.6.2.1 Market analysis
    - 4.6.2.2 Producers and production capacities
  - 4.6.3 Polytrimethylene terephthalate (Bio-PTT)
    - 4.6.3.1 Market analysis
    - 4.6.3.2 Producers and production capacities
  - 4.6.4 Polyethylene furanoate (Bio-PEF)
    - 4.6.4.1 Market analysis
    - 4.6.4.2 Comparative properties to PET
    - 4.6.4.3 Producers and production capacities
      - 4.6.4.3.1 FDCA and PEF producers and production capacities
  - 4.6.5 Polyamides (Bio-PA)
    - 4.6.5.1 Market analysis
    - 4.6.5.2 Producers and production capacities
  - 4.6.6 Poly(butylene adipate-co-terephthalate) (Bio-PBAT)- Aliphatic aromatic copolyesters
    - 4.6.6.1 Market analysis
    - 4.6.6.2 Producers and production capacities
  - 4.6.7 Polybutylene succinate (PBS) and copolymers
    - 4.6.7.1 Market analysis
    - 4.6.7.2 Producers and production capacities
  - 4.6.8 Polyethylene (Bio-PE)
    - 4.6.8.1 Market analysis

- 4.6.8.2 Producers and production capacities
- 4.6.9 Polypropylene (Bio-PP)
  - 4.6.9.1 Market analysis
  - 4.6.9.2 Producers and production capacities
- 4.7 NATURAL BIO-BASED POLYMERS
  - 4.7.1 Polyhydroxyalkanoates (PHA)
    - 4.7.1.1 Technology description
    - 4.7.1.2 Types
      - 4.7.1.2.1 PHB
      - 4.7.1.2.2 PHBV
    - 4.7.1.3 Synthesis and production processes
    - 4.7.1.4 Market analysis
    - 4.7.1.5 Commercially available PHAs
    - 4.7.1.6 Producers and production capacities
    - 4.7.1.7 PHAs in packaging
  - 4.7.2 Polysaccharides
    - 4.7.2.1 Microfibrillated cellulose (MFC)
      - 4.7.2.1.1 Market analysis
      - 4.7.2.1.2 Producers and production capacities
    - 4.7.2.2 Nanocellulose
      - 4.7.2.2.1 Cellulose nanocrystals
        - 4.7.2.2.1.1 Market analysis
        - 4.7.2.2.1.2 Producers and production capacities
      - 4.7.2.2.2 Cellulose nanofibers
        - 4.7.2.2.2.1 Market analysis
        - 4.7.2.2.2.2 Producers and production capacities
    - 4.7.2.3 Starch
      - 4.7.2.3.1 Production
        - 4.7.2.3.1.1 Thermoplastic starch (TPS)
        - 4.7.2.3.1.2 Producers
    - 4.7.3 Protein-based bioplastics
      - 4.7.3.1 Types, applications and producers
  - 4.8 Mycelium
    - 4.8.1 Properties
    - 4.8.2 Applications
    - 4.8.3 Producers
  - 4.9 Chitosan
    - 4.9.1 Properties
  - 4.10 Alginate

- 4.10.1 Advantages
- 4.10.2 Production
- 4.10.3 Producers

## **5 THE GLOBAL BIOPLASTICS MARKET**

- 5.1 Global production capacities for bioplastics by end user market 2019-2033
- 5.2 Processes for bioplastics in packaging
- 5.3 Flexible packaging
  - 5.3.1 Production volumes 2019-2033
- 5.4 Rigid packaging
  - 5.4.1 Production volumes 2019-2033
    - 5.4.1.1 By end-use application
- 5.5 Consumer products
- 5.6 Automotive
- 5.7 Building & construction
- 5.8 Textiles
- 5.9 Electronics
- 5.10 Agriculture and horticulture

## **6 THE NATURAL FIBERS MARKET**

- 6.1 Manufacturing method, matrix materials and applications of natural fibers
- 6.2 Advantages of natural fibers
- 6.3 Plants (cellulose, lignocellulose)
  - 6.3.1 Seed fibers
    - 6.3.1.1 Cotton
      - 6.3.1.1.1 Production volumes 2018-2033
    - 6.3.1.2 Kapok
      - 6.3.1.2.1 Production volumes 2018-2033
    - 6.3.1.3 Luffa
  - 6.3.2 Bast fibers
    - 6.3.2.1 Jute
      - 6.3.2.1.1 Production volumes 2018-2033
    - 6.3.2.2 Hemp
      - 6.3.2.2.1 Production volumes 2018-2033
    - 6.3.2.3 Flax
      - 6.3.2.3.1 Production volumes 2018-2033
    - 6.3.2.4 Ramie

- 6.3.2.4.1 Production volumes 2018-2033
- 6.3.2.5 Kenaf
  - 6.3.2.5.1 Production volumes 2018-2033
- 6.3.3 Leaf fibers
  - 6.3.3.1 Sisal
    - 6.3.3.1.1 Production volumes 2018-2033
  - 6.3.3.2 Abaca
    - 6.3.3.2.1 Production volumes 2018-2033
- 6.3.4 Fruit fibers
  - 6.3.4.1 Coir
    - 6.3.4.1.1 Production volumes 2018-2033
  - 6.3.4.2 Banana
    - 6.3.4.2.1 Production volumes 2018-2033
  - 6.3.4.3 Pineapple
- 6.3.5 Stalk fibers from agricultural residues
  - 6.3.5.1 Rice fiber
  - 6.3.5.2 Corn
- 6.3.6 Cane, grasses and reed
  - 6.3.6.1 Switch grass
  - 6.3.6.2 Sugarcane (agricultural residues)
  - 6.3.6.3 Bamboo
    - 6.3.6.3.1 Production volumes 2018-2033
  - 6.3.6.4 Fresh grass (green biorefinery)
- 6.4 Animal (fibrous protein)
  - 6.4.1 Wool
    - 6.4.1.1 Producers
  - 6.4.2 Silk fiber
    - 6.4.2.1 Producers
  - 6.4.3 Leather
    - 6.4.3.1 Producers
  - 6.4.4 Fur
    - 6.4.4.1 Producers
  - 6.4.5 Down
    - 6.4.5.1 Producers
- 6.5 MARKETS FOR NEXT-GEN NATURAL FIBERS
  - 6.5.1 Composites
    - 6.5.1.1 Applications
    - 6.5.1.2 Natural fiber injection moulding compounds
      - 6.5.1.2.1 Properties

- 6.5.1.2.2 Applications
- 6.5.1.3 Non-woven natural fiber mat composites
  - 6.5.1.3.1 Automotive
  - 6.5.1.3.2 Applications
- 6.5.1.4 Aligned natural fiber-reinforced composites
- 6.5.1.5 Natural fiber biobased polymer compounds
- 6.5.1.6 Natural fiber biobased polymer non-woven mats
  - 6.5.1.6.1 Flax
  - 6.5.1.6.2 Kenaf
- 6.5.1.7 Natural fiber thermoset bioresin composites
- 6.5.2 Aerospace
  - 6.5.2.1 Market overview
- 6.5.3 Automotive
  - 6.5.3.1 Market overview
  - 6.5.3.2 Applications of natural fibers
- 6.5.4 Building/construction
  - 6.5.4.1 Market overview
  - 6.5.4.2 Applications of natural fibers
- 6.5.5 Sports and leisure
  - 6.5.5.1 Market overview
- 6.5.6 Textiles
  - 6.5.6.1 Market overview
  - 6.5.6.2 Consumer apparel
  - 6.5.6.3 Geotextiles
- 6.5.7 Packaging
  - 6.5.7.1 Market overview
- 6.6 GLOBAL NATURAL FIBERS MARKET
  - 6.6.1 Overall global fibers market
  - 6.6.2 Plant-based fiber production
  - 6.6.3 Animal-based natural fiber production

## **7 BIOPLASTICS COMPANY PROFILES 206 (324 COMPANY PROFILES)**

## **8 NATURAL FIBER PRODUCERS AND PRODUCT DEVELOPER PROFILES 450 (178 COMPANY PROFILES)**

## **9 REFERENCES**



## List Of Tables

### LIST OF TABLES

Table 1. Market trends in biobased and sustainable plastics.

Table 2. Global production capacities of biobased and sustainable plastics 2018-2033, in 1,000 tons.

Table 3. Global production capacities, by producers.

Table 4. Global production capacities of biobased and sustainable plastics 2019-2033, by type, in 1,000 tons.

Table 5. Challenges for bioplastics in packaging.

Table 6. Types of next-gen natural fibers.

Table 7. Markets and applications for natural fibers.

Table 8. Recent commercial activity in next-gen natural fibers.

Table 9. Commercially available next-gen natural fiber products.

Table 10. Market drivers for natural fibers.

Table 11. Issues related to the use of plastics.

Table 12. Types of bio-based plastics and fossil-fuel-based plastics

Table 13. Comparison of synthetic fossil-based and bio-based polymers.

Table 14. Type of biodegradation.

Table 15. Advantages and disadvantages of biobased plastics compared to conventional plastics.

Table 16. Types of Bio-based and/or Biodegradable Plastics, applications.

Table 17. Market leader by Bio-based and/or Biodegradable Plastic types.

Table 18. Polylactic acid (PLA) market analysis-manufacture, advantages, disadvantages and applications.

Table 19. Lactic acid producers and production capacities.

Table 20. PLA producers and production capacities.

Table 21. Planned PLA capacity expansions in China.

Table 22. Bio-based Polyethylene terephthalate (Bio-PET) market analysis-manufacture, advantages, disadvantages and applications.

Table 23. Bio-based Polyethylene terephthalate (PET) producers and production capacities,

Table 24. Polytrimethylene terephthalate (PTT) market analysis-manufacture, advantages, disadvantages and applications.

Table 25. Production capacities of Polytrimethylene terephthalate (PTT), by leading producers.

Table 26. Polyethylene furanoate (PEF) market analysis-manufacture, advantages, disadvantages and applications.

Table 27. PEF vs. PET.

Table 28. FDCA and PEF producers.

Table 29. Bio-based polyamides (Bio-PA) market analysis - manufacture, advantages, disadvantages and applications.

Table 30. Leading Bio-PA producers production capacities.

Table 31. Poly(butylene adipate-co-terephthalate) (PBAT) market analysis- manufacture, advantages, disadvantages and applications.

Table 32. Leading PBAT producers, production capacities and brands.

Table 33. Bio-PBS market analysis- manufacture, advantages, disadvantages and applications.

Table 34. Leading PBS producers and production capacities.

Table 35. Bio-based Polyethylene (Bio-PE) market analysis- manufacture, advantages, disadvantages and applications.

Table 36. Leading Bio-PE producers.

Table 37. Bio-PP market analysis- manufacture, advantages, disadvantages and applications.

Table 38. Leading Bio-PP producers and capacities.

Table 39. Types of PHAs and properties.

Table 40. Comparison of the physical properties of different PHAs with conventional petroleum-based polymers.

Table 41. Polyhydroxyalkanoate (PHA) extraction methods.

Table 42. Polyhydroxyalkanoates (PHA) market analysis.

Table 43. Commercially available PHAs.

Table 44. Polyhydroxyalkanoates (PHA) producers.

Table 45. Markets and applications for PHAs.

Table 46. Applications, advantages and disadvantages of PHAs in packaging.

Table 47. Microfibrillated cellulose (MFC) market analysis- manufacture, advantages, disadvantages and applications.

Table 48. Leading MFC producers and capacities.

Table 49. Cellulose nanocrystals analysis.

Table 50: Cellulose nanocrystal production capacities and production process, by producer.

Table 51. Cellulose nanofibers market analysis.

Table 52. CNF production capacities (by type, wet or dry) and production process, by producer, metric tonnes.

Table 53. Starch-based bioplastic producers.

Table 54. Types of protein based-bioplastics, applications and companies.

Table 55. Overview of mycelium fibers-description, properties, drawbacks and applications.

Table 56. Companies developing mycelium-based bioplastics.

Table 57. Overview of chitosan fibers-description, properties, drawbacks and applications.

Table 58. Overview of alginate-description, properties, application and market size.

Table 59. Companies developing algal-based bioplastics.

Table 60. Global production capacities for bioplastics by end user market 2019-2033, 1,000 tons.

Table 61. Processes for bioplastics in packaging.

Table 62. Comparison of bioplastics' (PLA and PHAs) properties to other common polymers used in product packaging.

Table 63. Typical applications for bioplastics in flexible packaging.

Table 64. Typical applications for bioplastics in rigid packaging.

Table 65. Global bioplastics packaging by end-use application, 2023–2033 ('000 tons).

Table 66. Application, manufacturing method, and matrix materials of natural fibers.

Table 67. Typical properties of natural fibers.

Table 68. Overview of cotton fibers-description, properties, drawbacks and applications.

Table 69. Overview of kapok fibers-description, properties, drawbacks and applications.

Table 70. Overview of luffa fibers-description, properties, drawbacks and applications.

Table 71. Overview of jute fibers-description, properties, drawbacks and applications.

Table 72. Overview of hemp fibers-description, properties, drawbacks and applications.

Table 73. Overview of flax fibers-description, properties, drawbacks and applications.

Table 74. Overview of ramie fibers-description, properties, drawbacks and applications.

Table 75. Overview of kenaf fibers-description, properties, drawbacks and applications.

Table 76. Overview of sisal fibers-description, properties, drawbacks and applications.

Table 77. Overview of abaca fibers-description, properties, drawbacks and applications.

Table 78. Overview of coir fibers-description, properties, drawbacks and applications.

Table 79. Overview of banana fibers-description, properties, drawbacks and applications.

Table 80. Overview of pineapple fibers-description, properties, drawbacks and applications.

Table 81. Overview of rice fibers-description, properties, drawbacks and applications.

Table 82. Overview of corn fibers-description, properties, drawbacks and applications.

Table 83. Overview of switch grass fibers-description, properties and applications.

Table 84. Overview of sugarcane fibers-description, properties, drawbacks and application and market size.

Table 85. Overview of bamboo fibers-description, properties, drawbacks and applications.

Table 86. Overview of wool fibers-description, properties, drawbacks and applications.

Table 87. Next-gen wool producers.

- Table 88. Overview of silk fibers-description, properties, application and market size.
- Table 89. Next-gen silk producers.
- Table 90. Next-gen leather producers.
- Table 91. Next-gen fur producers.
- Table 92. Next-gen down producers.
- Table 93. Applications of natural fiber composites.
- Table 94. Typical properties of short natural fiber-thermoplastic composites.
- Table 95. Properties of non-woven natural fiber mat composites.
- Table 96. Properties of aligned natural fiber composites.
- Table 97. Properties of natural fiber-bio-based polymer compounds.
- Table 98. Properties of natural fiber-bio-based polymer non-woven mats.
- Table 99. Natural fibers in the aerospace sector-market drivers, applications and challenges for NF use.
- Table 100. Natural fiber-reinforced polymer composite in the automotive market.
- Table 101. Natural fibers in the automotive sector- market drivers, applications and challenges for NF use.
- Table 102. Applications of natural fibers in the automotive industry.
- Table 103. Natural fibers in the building/construction sector- market drivers, applications and challenges for NF use.
- Table 104. Applications of natural fibers in the building/construction sector.
- Table 105. Natural fibers in the sports and leisure sector-market drivers, applications and challenges for NF use.
- Table 106. Natural fibers in the textiles sector-market drivers, applications and challenges for NF use.
- Table 107. Natural fibers in the packaging sector-market drivers, applications and challenges for NF use.
- Table 108. Granbio Nanocellulose Processes.
- Table 109. Oji Holdings CNF products.
- Table 110. Granbio Nanocellulose Processes.
- Table 111. Oji Holdings CNF products.

## List Of Figures

### LIST OF FIGURES

Figure 1. Total global production capacities for biobased and sustainable plastics, all types, 000 tons.

Figure 2. Global production capacities of bioplastics 2018-2033, in 1,000 tons by biodegradable/non-biodegradable types.

Figure 3. Global production capacities of biobased and sustainable plastics in 2019-2033, by type, in 1,000 tons.

Figure 4. Global production capacities of bioplastics in 2019-2033, by type.

Figure 5. Global production capacities of biobased and sustainable plastics 2019-2033, by region, tonnes.

Figure 6. Current and future applications of biobased and sustainable plastics.

Figure 7. Global demand for biobased and sustainable plastics by end user market, 2021

Figure 8. Global production capacities for biobased and sustainable plastics by end user market 2019-2033, tons.

Figure 9. Absolut natural based fiber bottle cap.

Figure 10. Adidas algae-ink tees.

Figure 11. Carlsberg natural fiber beer bottle.

Figure 12. Miratex watch bands.

Figure 13. Adidas Made with Nature Ultraboost 22.

Figure 14. PUMA RE:SUEDE sneaker

Figure 15. Global plastics production 1950-2020, millions of tons.

Figure 16. The circular plastic economy.

Figure 17. Routes for synthesizing polymers from fossil-based and bio-based resources.

Figure 18. Coca-Cola PlantBottle®.

Figure 19. Interrelationship between conventional, bio-based and biodegradable plastics.

Figure 20. Production capacities of Polyethylene furanoate (PEF) to 2025.

Figure 21. PHA family.

Figure 22. Typical structure of mycelium-based foam.

Figure 23. Commercial mycelium composite construction materials.

Figure 24. Frayme Mylo?.

Figure 25. BLOOM masterbatch from Algix.

Figure 26. Global production capacities for bioplastics by end user market 2019-2033, 1,000 tons.

Figure 27. PHA bioplastic packaging products.

Figure 28. Bioplastics for flexible packaging by bioplastic material type, 2019–2033 ('000 tons).

Figure 29. Bioplastics for rigid packaging by bioplastic material type, 2019–2033 ('000 tons).

Figure 30. Global bioplastics packaging by end-use application, 2023–2033 ('000 tons).

Figure 31. Global production capacities for biobased and sustainable plastics in consumer products 2019-2033, in 1,000 tons.

Figure 32. Global production capacities for biobased and sustainable plastics in automotive 2019-2033, in 1,000 tons.

Figure 33. Global production capacities for biobased and sustainable plastics in building and construction 2019-2033, in 1,000 tons.

Figure 34. Global production capacities for biobased and sustainable plastics in textiles 2019-2033, in 1,000 tons.

Figure 35. Global production capacities for biobased and sustainable plastics in electronics 2019-2033, in 1,000 tons.

Figure 36. Biodegradable mulch films.

Figure 37. Global production capacities for biobased and sustainable plastics in agriculture 2019-2033, in 1,000 tons.

Figure 38. Types of natural fibers.

Figure 39. Cotton production volume 2018-2033 (Million MT).

Figure 40. Kapok production volume 2018-2033 (MT).

Figure 41. Luffa cylindrica fiber.

Figure 42. Jute production volume 2018-2033 (Million MT).

Figure 43. Hemp fiber production volume 2018-2033 ( MT).

Figure 44. Flax fiber production volume 2018-2033 (MT).

Figure 45. Ramie fiber production volume 2018-2033 (MT).

Figure 46. Kenaf fiber production volume 2018-2033 (MT).

Figure 47. Sisal fiber production volume 2018-2033 (MT).

Figure 48. Abaca fiber production volume 2018-2033 (MT).

Figure 49. Coir fiber production volume 2018-2033 (MILLION MT).

Figure 50. Banana fiber production volume 2018-2033 (MT).

Figure 51. Pineapple fiber.

Figure 52. A bag made with pineapple biomaterial from the H&M Conscious Collection 2019.

Figure 53. Bamboo fiber production volume 2018-2033 (MILLION MT).

Figure 54. Conceptual landscape of next-gen leather materials.

Figure 55. Hemp fibers combined with PP in car door panel.

Figure 56. Car door produced from Hemp fiber.

Figure 57. Natural fiber composites in the BMW M4 GT4 racing car.



- Figure 58. Mercedes-Benz components containing natural fibers.
- Figure 59. AlgiKicks sneaker, made with the Algiknit biopolymer gel.
- Figure 60. Coir mats for erosion control.
- Figure 61. Global fiber production in 2021, by fiber type, million MT and %.
- Figure 62. Global fiber production (million MT) to 2020-2033.
- Figure 63. Plant-based fiber production 2018-2033, by fiber type, MT.
- Figure 64. Animal based fiber production 2018-2033, by fiber type, million MT.
- Figure 65. Algiknit yarn.
- Figure 66. Bio-PA rear bumper stay.
- Figure 67. formicobio technology.
- Figure 68. nanoforest-S.
- Figure 69. nanoforest-PDP.
- Figure 70. nanoforest-MB.
- Figure 71. CuanSave film.
- Figure 72. ELLEX products.
- Figure 73. CNF-reinforced PP compounds.
- Figure 74. Kirekira! toilet wipes.
- Figure 75. Mushroom leather.
- Figure 76. Cellulose Nanofiber (CNF) composite with polyethylene (PE).
- Figure 77. PHA production process.
- Figure 78. Cutlery samples (spoon, knife, fork) made of nano cellulose and biodegradable plastic composite materials.
- Figure 79. Non-aqueous CNF dispersion 'Senaf' (Photo shows 5% of plasticizer).
- Figure 80. CNF gel.
- Figure 81. Block nanocellulose material.
- Figure 82. CNF products developed by Hokuetsu.
- Figure 83. Lactips plastic pellets.
- Figure 84. Made of Air's HexChar panels.
- Figure 85. IPA synthesis method.
- Figure 86. MOGU-Wave panels.
- Figure 87. Reishi.
- Figure 88. Nippon Paper Industries' adult diapers.
- Figure 89. Compostable water pod.
- Figure 90. CNF clear sheets.
- Figure 91. Oji Holdings CNF polycarbonate product.
- Figure 92. Manufacturing process for STARCEL.
- Figure 93. Lyocell process.
- Figure 94. Spider silk production.
- Figure 95. Sulapac cosmetics containers.

- Figure 96. Sulzer equipment for PLA polymerization processing.
- Figure 97. Teijin bioplastic film for door handles.
- Figure 98. Corbion FDCA production process.
- Figure 99. Visolis' Hybrid Bio-Thermocatalytic Process.
- Figure 100. Pluumo.
- Figure 101. Algiknit yarn.
- Figure 102. Amadou leather shoes.
- Figure 103. Anpoly cellulose nanofiber hydrogel.
- Figure 104. MEDICELLU.
- Figure 105. Asahi Kasei CNF fabric sheet.
- Figure 106. Properties of Asahi Kasei cellulose nanofiber nonwoven fabric.
- Figure 107. CNF nonwoven fabric.
- Figure 108. Roof frame made of natural fiber.
- Figure 109. Tras Rei chair incorporating ampliTex fibers.
- Figure 110. Natural fibres racing seat.
- Figure 111. Porche Cayman GT4 Clubsport incorporating BComp flax fibers.
- Figure 112. Beyond Leather Materials product.
- Figure 113. Fiber-based screw cap.
- Figure 114. Cellugy materials.
- Figure 115. nanoforest-S.
- Figure 116. nanoforest-PDP.
- Figure 117. nanoforest-MB.
- Figure 118. CuanSave film.
- Figure 119. Celish.
- Figure 120. Trunk lid incorporating CNF.
- Figure 121. ELLEX products.
- Figure 122. CNF-reinforced PP compounds.
- Figure 123. Kirekira! toilet wipes.
- Figure 124. Color CNF.
- Figure 125. Rheocrysta spray.
- Figure 126. DKS CNF products.
- Figure 127. Mushroom leather.
- Figure 128. CNF based on citrus peel.
- Figure 129. Citrus cellulose nanofiber.
- Figure 130. Filler Bank CNC products.
- Figure 131. Fibers on kapok tree and after processing.
- Figure 132. Water-repellent cellulose.
- Figure 133. Cellulose Nanofiber (CNF) composite with polyethylene (PE).
- Figure 134. CNF products from Furukawa Electric.



- Figure 135. Cutlery samples (spoon, knife, fork) made of nano cellulose and biodegradable plastic composite materials.
- Figure 136. Non-aqueous CNF dispersion 'Senaf' (Photo shows 5% of plasticizer).
- Figure 137. CNF gel.
- Figure 138. Block nanocellulose material.
- Figure 139. CNF products developed by Hokuetsu.
- Figure 140. Marine leather products.
- Figure 141. Inner Mettle Milk products.
- Figure 142. Dual Graft System.
- Figure 143. Engine cover utilizing Kao CNF composite resins.
- Figure 144. Acrylic resin blended with modified CNF (fluid) and its molded product (transparent film), and image obtained with AFM (CNF 10wt% blended).
- Figure 145. Kami Shoji CNF products.
- Figure 146. 0.3% aqueous dispersion of sulfated esterified CNF and dried transparent film (front side).
- Figure 147. Nike Algae Ink graphic tee.
- Figure 148. BioFlex process.
- Figure 149. TransLeather.
- Figure 150. Chitin nanofiber product.
- Figure 151. Marusumi Paper cellulose nanofiber products.
- Figure 152. FibriMa cellulose nanofiber powder.
- Figure 153. Cellulomix production process.
- Figure 154. Nanobase versus conventional products.
- Figure 155. MOGU-Wave panels.
- Figure 156. CNF slurries.
- Figure 157. Range of CNF products.
- Figure 158. Reishi.
- Figure 159. Natural Fiber Welding, Inc. materials.
- Figure 160. Nippon Paper Industries' adult diapers.
- Figure 161. Leather made from leaves.
- Figure 162. Nike shoe with beLEAF.
- Figure 163. CNF clear sheets.
- Figure 164. Oji Holdings CNF polycarbonate product.
- Figure 165. Fabric consisting of 70 per cent wool and 30 per cent Qmilk.
- Figure 166. XCNF.
- Figure 167. LOVR hemp leather.
- Figure 168. CNF insulation flat plates.
- Figure 169. Manufacturing process for STARCEL.
- Figure 170. 3D printed cellulose shoe.

Figure 171. Lyocell process.

Figure 172. North Face Spiber Moon Parka.

Figure 173. PANGAIA LAB NXT GEN Hoodie.

Figure 174. Spider silk production.

Figure 175. 2 wt.% CNF suspension.

Figure 176. BiNF-i-s Dry Powder.

Figure 177. BiNF-i-s Dry Powder and Propylene (PP) Complex Pellet.

Figure 178. Silk nanofiber (right) and cocoon of raw material.

Figure 179. Sulapac cosmetics containers.

Figure 180. Comparison of weight reduction effect using CNF.

Figure 181. CNF resin products.

Figure 182. Vegea production process.

Figure 183. HefCel-coated wood (left) and untreated wood (right) after 30 seconds flame test.

Figure 184. Bio-based barrier bags prepared from Tempo-CNF coated bio-HDPE film.

Figure 185. Worn Again products.

Figure 186. Zelfo Technology GmbH CNF production process.

## I would like to order

Product name: The Global Market for Bioplastics and Natural Fibers 2023-2033

Product link: <https://marketpublishers.com/r/GB60982FAED2EN.html>

Price: US\$ 1,750.00 (Single User License / Electronic Delivery)

If you want to order Corporate License or Hard Copy, please, contact our Customer Service:

[info@marketpublishers.com](mailto:info@marketpublishers.com)

## Payment

To pay by Credit Card (Visa, MasterCard, American Express, PayPal), please, click button on product page <https://marketpublishers.com/r/GB60982FAED2EN.html>

To pay by Wire Transfer, please, fill in your contact details in the form below:

First name:  
Last name:  
Email:  
Company:  
Address:  
City:  
Zip code:  
Country:  
Tel:  
Fax:  
Your message:

**\*\*All fields are required**

Customer signature \_\_\_\_\_

Please, note that by ordering from marketpublishers.com you are agreeing to our Terms & Conditions at <https://marketpublishers.com/docs/terms.html>

To place an order via fax simply print this form, fill in the information below and fax the completed form to +44 20 7900 3970