



100% bio from renewable sources

# Let's spill the beans

## A new way to produce fibres and textiles, fully nature sourced

This story begins in India under the name of "**Eranda**" an **outstanding vegetable** raw material able to generate countless solutions and great performances. "Eranda" is the Hindi name for castor bean, a bean which carries along great values.

Let's discover how a castor bean can give life to unique sustainable fabrics.

From RadiciGroup strong development capabilities and longstanding experience in the world of bio-based materials **Biofeel® Eleven is born**. This new product, part of the Biofeel® family, is a **100% bio-based yarn**.

### Historically

Castor beans have been found in Egyptian tombs dating back to 4000 BC; the slow-burning oil was mostly used to fuel lamps. Herodotus and other Greek travelers noted the use of castor bean oil for lighting, body ointments, and improving hair growth and texture. Cleopatra is reputed to have used it to brighten the whites of her eyes. In India, the use of castor bean oil has been documented since 2000 BC in lamps and in local medicine and other ethnomedical systems.

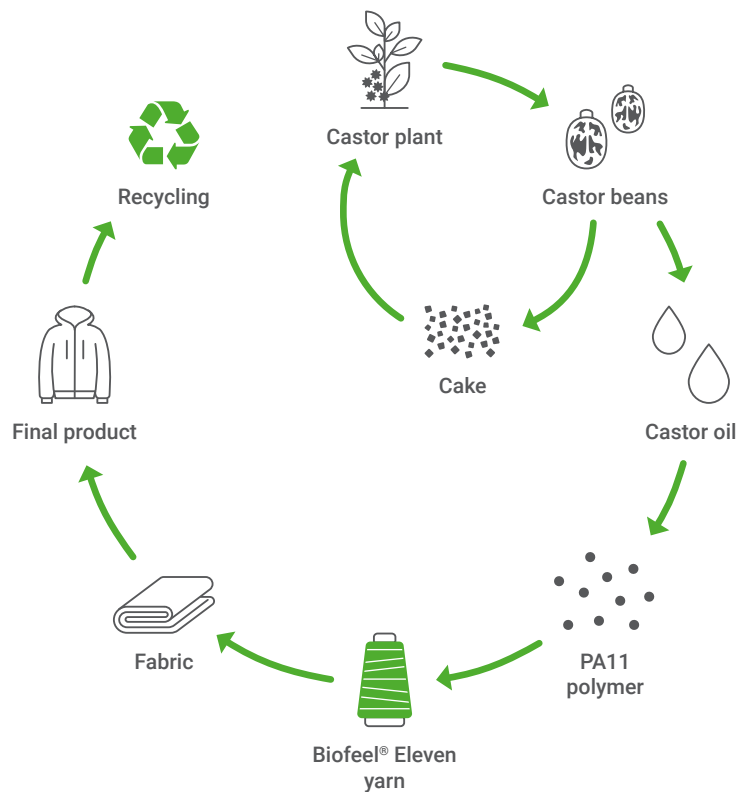
### Geographically

Nowadays, 80% of the world's supply of castor bean is produced annually in India (~1.2 million tons) and most of the castor crop grows in the region of Gujarat, which has ideal climatic conditions due to monsoon cycles.



## Biofeel<sup>®</sup> Eleven production cycle

The **castor plant** is a perennial flowering plant. The **beans contain about 45%** oil that is rich mainly in ricinolein, from which the **bio-polymer polyamide 11** is obtained. This is the polymer RadiciGroup uses for its **Biofeel<sup>®</sup> Eleven yarn**. The remaining cake is used as high efficient bio-fertilizer which returns to the soil.



## Fair from raw material

Castor is a climate resilient crop and it is resistant to drought. If irrigated through good water management practices, it requires less water compared to normal irrigation. For this reason, castor farmers are empowered on the use of the best irrigation techniques to avoid waste. Since castor is a wide spaced – long duration crop, it facilitates cultivation of short duration intercrops like legumes & sesame. Castor has proved to be an excellent choice for farmers, since it can be easily stocked and sold when necessary or when market conditions are favorable. It is recommended as a sustainable crop.

**Biofeel<sup>®</sup> Eleven is 100% obtained from the castor plant**, a natural product. Right cultivation and farming practices guarantee:

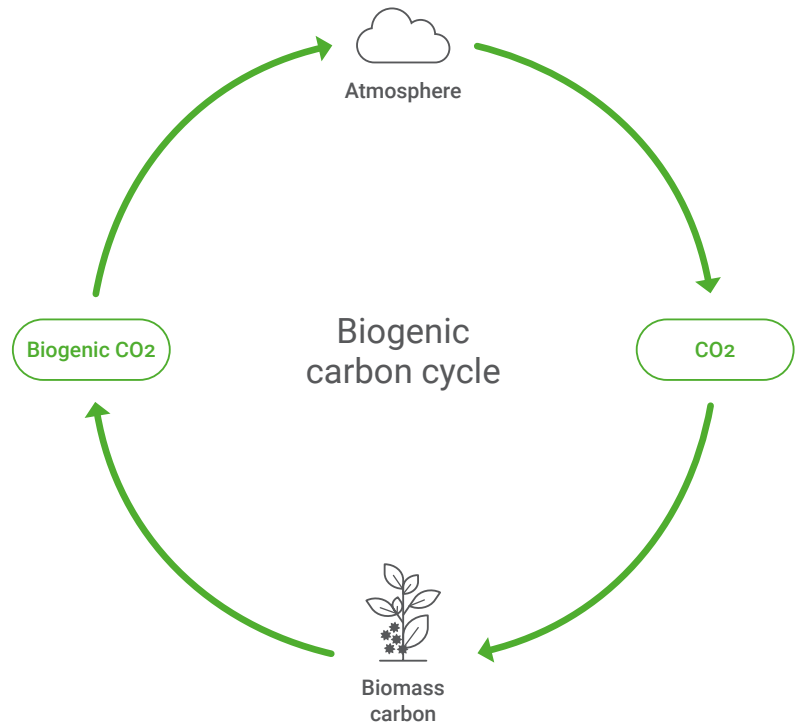
- It is cultivated **not in competition with human or animal food**.
- It **doesn't cause deforestation**.
- It is **grown in poor soil**.
- It is **naturally drought resistant**.
- It is a **secure income source** for the farmers.
- It is **vegan**.

# Renewable feedstock

Plants have the unique ability to remove carbon dioxide (CO<sub>2</sub>) from the atmosphere and deposit that carbon into leaves, roots and stems, while oxygen is released back into the atmosphere.

This process is known as photosynthesis. It is 100% powered by sunlight and it is central to the biogenic carbon cycle.

Biogenic carbon is mostly regarded as preferable to fossil carbon, given the fact that it can be replenished quicker than its counterpart. When plants are cut down to be used as biomass, they are generally replaced with new ones. This means that any emission from their consumption is significantly reduced, since a proportional amount of greenhouse gasses will be consumed by the organic matter which replaces them.



# Why choose Biofeel® Eleven

RadiciGroup is the only yarn manufacturer in Europe which can offer yarn from polyamide 11.

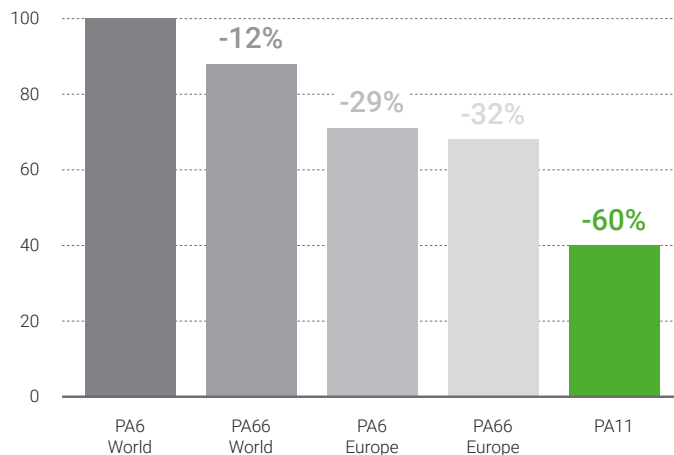
Biofeel® Eleven gives the opportunity to be more sustainable in several ways:

- It is **100% bio-based**.
- It comes from **highly efficient use of raw materials**.
- It is **100% recyclable**.
- It is **durable**, with a long-lasting quality.
- It can be **raw white** or **solution dyed**.
- Its production is powered by **green energy**, which comes from renewable sources.
- It comes from a **polymer** with low environmental impact **according to the LCA method**.

## Polymer LCAs: a comparison

Polymer

% of reduction of Global Warming Potential Vs PA6 world



### The goal?

To provide the next generation of low environmental impact products based on scientific impact data.

#### Data Source:

PA11 polymer: LCA primary data from Arkema, 2022;  
PA66 EU-27 polymer: Industry data 2.0;  
PA66 world polymer: Ecoinvent 3.8;  
PA6 world polymer: Ecoinvent 3.8;  
PA6 EU-27 polymer: Industry data 2.0.

#### Calculation Method:

EN15804 + A2 version 1.02, only GWP total category, software SimaPro 9.4.

## RadiciGroup is strongly committed to environmental protection

- Carefully selecting **low impact feedstocks** also when they are oil based.
- Producing value by offering durable and **high quality materials**.
- Creating synergies with partners with the same mindset in **creating value**.
- Striving for verified and **certified processes and products**.
- Being a reliable upstream partner to develop solutions for more **circular products**.

# Why Biofeel® Eleven performances are unique?

Biofeel® Eleven, due to its characteristics is the ideal ingredient brand for different applications.

## limited water absorption

Good dimensional stability due to low water absorption.

Ideal for **sportswear**.

## light weight

The low-density polymer allows the production of light weight fabrics.

Ideal for **sportswear** and **luxury apparel**.

## flexible

Great resistance to permanent deformation under bending, lateral stress and strain.

Ideal for **sportswear** and **luxury apparel**.

## durable

Good performance and long-lasting quality.

Ideal for **accessories**, **furniture**, **industrial** and **automotive textiles**.

## pleasant to the touch

Nice touch and comfort which give an exclusive feeling.

Ideal for **intimate wear** and **fashion apparel**.

## chemical-resistant

Highly resistant to harsh chemicals and conditions.

Ideal for **workwear** and **industrial applications**.

Furthermore Biofeel® Eleven is...

## highly versatile

It can be **used with different technologies**.

For example: seamless, hosiery machines, circular knitting and weaving.

## Performing from raw material

Biofeel® Eleven is the result of a long **research** and **innovation** work by RadiciGroup which has collaborated with Arkema, to implement concrete **circularity** through the **non-fossil-based origin** of this material and its complete **recyclability**. RadiciGroup is proud to collaborate with likely-minded partners for limited impact products.

Thanks to a number of **value chain research**, development and innovation activities, over the years the beans that produce castor oil have been selected for obtaining the best quality characteristics. The **beans** and plants have been **naturally chosen** for the best results for different applications. Today there are archives dedicated to the different types of beans which are also certified. Furthermore this selection work allows the farmers to cultivate castor plants in the ideal way.

# Biofeel<sup>®</sup> Eleven endless possibilities

RadiciGroup experts collaborate with customers to find the optimal solution for different sectors.



## Advantages of co-branding with RadiciGroup

RadiciGroup is available for cooperation in order to associate the Biofeel<sup>®</sup> Eleven brand to textile collections. The co-branding:

- unlashes creativity;
- grants transparent supply chain and traceability of products;
- is an example of sustainability for the market;
- ensures a deeply-rooted know-how in synthetic fibres.



# RadiciGroup. Inside your world.

RadiciGroup is one of the world's leading producers of a wide range of chemical intermediates, polyamide polymers, high performance engineering polymers and advanced textile solutions, including nylon yarn, polyester yarn, yarn made from recovered and bio-source materials, nonwovens and personal protective equipment for the industrial and healthcare fields. These products are the result of the Group's outstanding chemical expertise and vertically integrated polyamide production chain and have been developed for use in a variety of industrial sectors, such as: automotive, electrical and electronics, household appliances, consumer and industrial goods, apparel, furnishing, construction, sports. The basis of the Group's strategy is a strong focus on innovation, quality, customer satisfaction and social and environmental sustainability.

## Sustainability

Every day at RadiciGroup, we work to make circularity our business model. We optimize the use of materials while fine-tuning our processes, eliminating waste and promoting recyclability from the earliest product design phases. We are always looking for low-impact solutions in terms of natural resources and energy. We rely on certified management systems for Quality, Health and Safety, Environment and Energy to keep our companies in line with the highest sustainability standards.



Data Source: RadiciGroup Sustainability Reports



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