



## Choosing a sensible path to sustainability

**At AFYREN we are committed to producing 100% biobased products from renewable raw materials through a fully dedicated process that follows the segregated biobased chemistry approach. But what does it really mean ? There are lots of interesting green initiatives in the chemical industry these days. Here are some tools to help you make sense of them.**

Biobased and bioeconomy, mass balance, organic, bio – these are just a few of the innovative concepts and solutions that contribute to sustainability but may add complexity to the already difficult task of making educated choices.

As both private and industrial consumers become more conscientious about mitigating their environmental footprints, the demand for «green chemistry» is growing and the market is progressively diversifying its sources of raw materials.

In this context, new products are being introduced to the market with various claims and labelling. Some of these products are described as “biobased products”, “products made from sustainable raw materials”, “products with renewable contents” or simply “green products”. Each of these terms has a meaning, and some terms may be used imprecisely, leading to confusion.

**Knowing that their choices influence practices and norms that are developed upstream, customers need to understand – and question – what these concepts mean. If they don't, others certainly will.**

**At AFYREN, our long-term commitment is to build a consistent and competitive circular bioeconomy business model. As one of the leading players in this arena, we can add some clarity.**

# 1. Different approaches

## Book and Claim

Book and Claim describes a model that financially supports the global production of certified sustainably produced goods. This system is very useful when the available volume of sustainable products on the market is neither sufficient nor accessible enough to meet demand. Examples of book and claim systems include credits for renewable energy (ex: green electricity), or sustainable sugar or soy.

**The certified product / component evolves in separate flows from the certified supply and is completely disconnected from the certification data. It does not physically contain the sustainable product.**

When applied to bioeconomy, a book and claim system is used to help develop the sustainable production of renewable feedstocks. It was a useful tool in the development of RSPO<sup>1</sup> palm oil for example.

## Mass Balance

Mass Balance describes a model that supports the global production of certified sustainably produced products with a direct contribution to industrial production volumes. Indeed, the various sources of raw materials ("conventional" and "more sustainable") are comingled in an integrated production system. The sustainable input is distributed into the whole production system and then allocated to a selection of final certified products which are physically connected with the production system but may not contain the sustainable input. Certification is provided by an independent, third-party body. **The final certified products benefit from a claim that reflects the sustainable approach but not necessarily its exact physical content.**

The Mass Balance model encourages supply chain actors to buy and use more sustainably produced products in a cost-efficient manner. It is commonly used in many chains of custody (sustainable forestry; recycled, bio-based or renewable materials; aluminum; organic cotton; coffee, etc.)

When applied to bioeconomy, the Mass Balance approach involves the gradual substitution of fossil feedstocks by renewable feedstocks, with attribution along the value chain. (see figure 1)

**These products should be considered as Renewable Attributed Products and must not be called "bio-based products" in order to avoid any confusion of the consumer.** Further claims are derived from exchanging fossil feedstock for renewable feedstock through the process as described above (ex: fossil resource savings, fossil carbon savings ...).

The international standard ISO 14021<sup>2</sup> specifies requirements for self-declared environmental claims regarding industrial products. It further describes selected terms commonly used in environmental claims and sets criteria for their use.

Feedstocks should be responsibly sourced and certified by independent third-party bodies based on existing multi-stakeholder standards and/or labels and programs based on legislation.

## Segregation

Segregation consists of the aggregation of volumes of products of identical origin or produced according to the same standards in one stock item. Segregated products are made from a mixture of feedstocks that are mixed in the same production line. **The claim of the final product reflects the approach and its exact physical content (which can be measured and verified by normalized methods).**

When applied to bioeconomy, a segregated approach consists of materials or molecules produced with a mixture of fossil and renewable raw materials. Fossil resources and renewable feedstocks are mixed in the same production system and flows are merged. The final product physically contains exactly what is claimed and what has been integrated at the beginning of the process (see figure 1). If the final product is made only from renewable raw materials, then it is 100% biobased. It is possible to account for the biobased content at all stages of the transformation from raw materials to finished products. **Biobased products are defined in the American and European standards ASTM6866<sup>3</sup> and CEN/TC411<sup>4</sup>.**

Within these standards, the norms ISO 16620-2<sup>5</sup> and EN 16785-1<sup>6</sup> detail the requirements for determining biobased content of a given product using radiocarbon (Carbon-14) analysis and elemental analysis.

1. <https://rspo.org/certification/supply-chains>  
 2. <https://www.iso.org/standard/66652.html>  
 3. <https://www.astm.org/Standards/D6866.htm>  
 4. <https://standards.cen.eu/dyn/www/f?p=204:7:0::FSP%0RGE%ID:874780&cs=112703B035FC937E906D8EFA5DA87FAB8>  
 5. <https://www.iso.org/fr/standard/72474.html>  
 6. [https://standards.cen.eu/dyn/www/f?p=CENWEB:110::FSP\\_ORG\\_ID:FSP\\_PROJECT:874780,40882&cs=1AB0C9A2752E919B299B4E6B12A84A9B1](https://standards.cen.eu/dyn/www/f?p=CENWEB:110::FSP_ORG_ID:FSP_PROJECT:874780,40882&cs=1AB0C9A2752E919B299B4E6B12A84A9B1)

# Simplified overview of main bioeconomy chains of custody

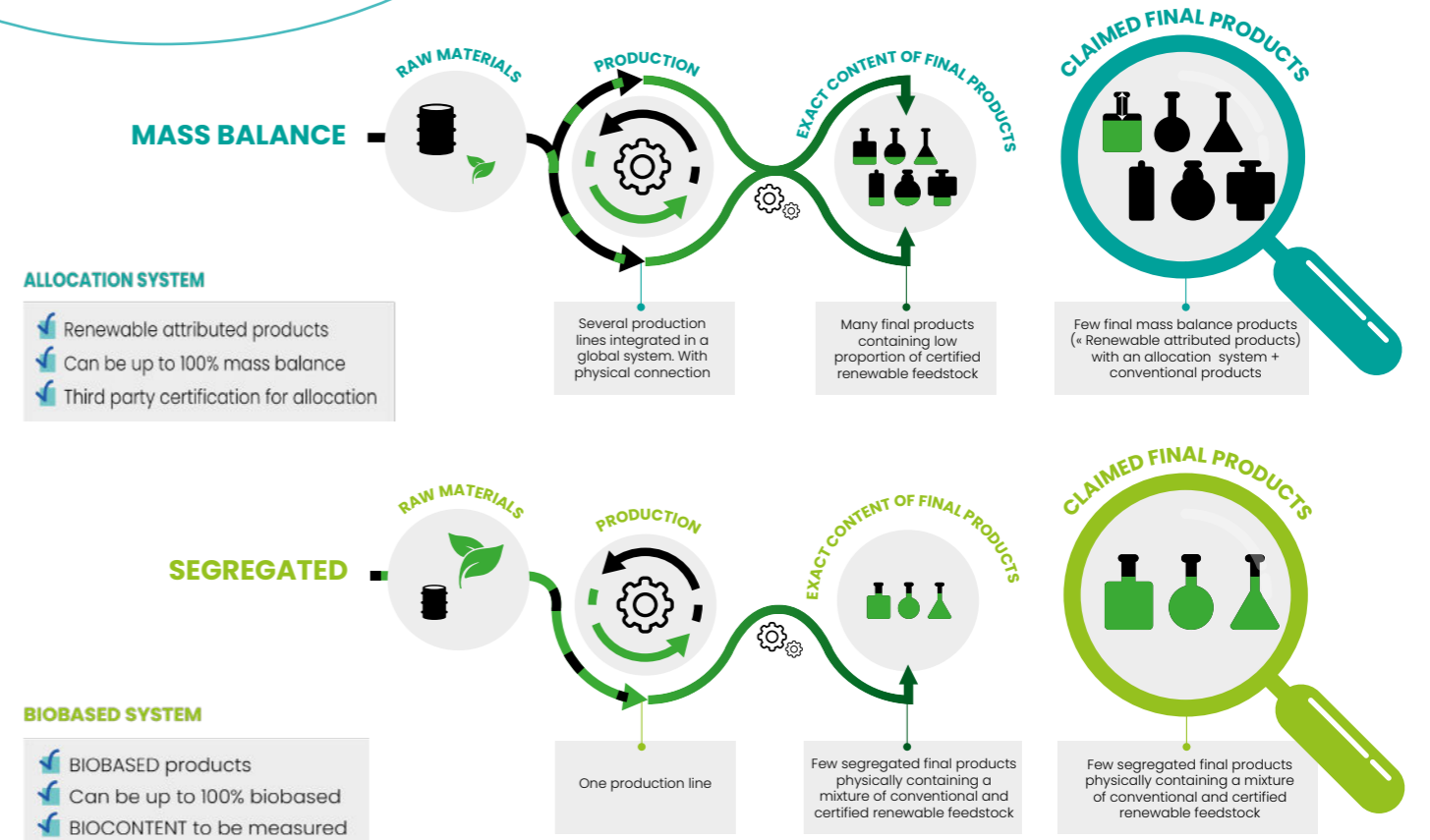


Figure 1

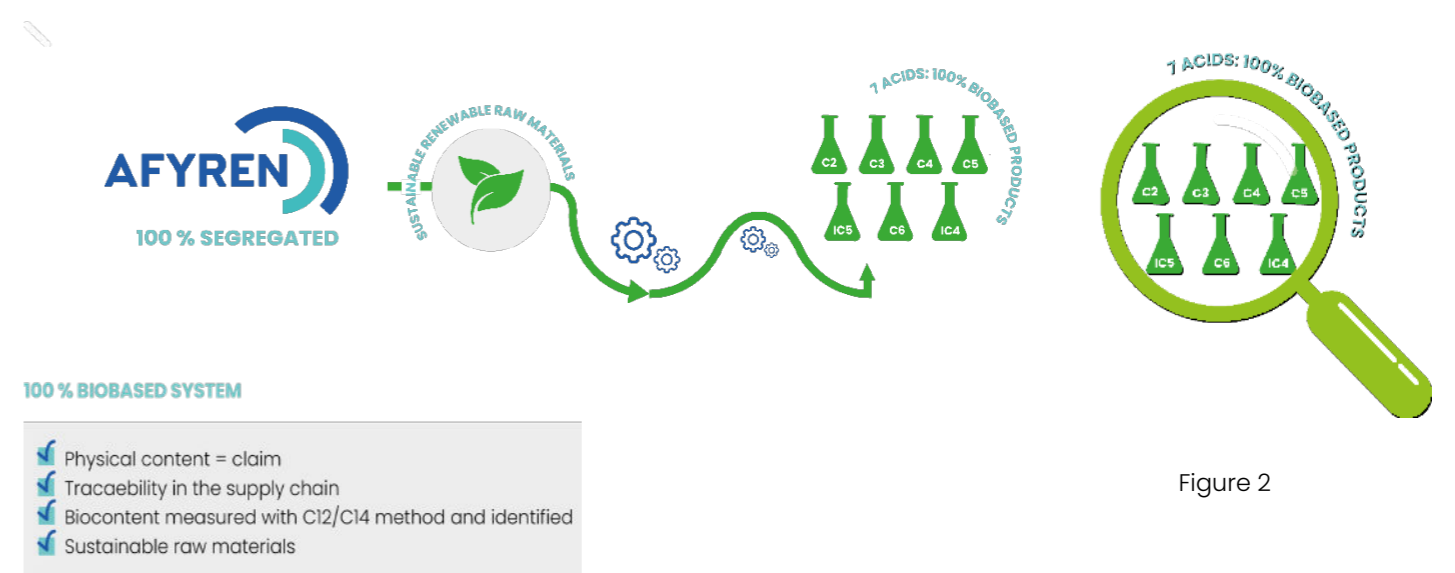


Figure 2



## 2. The AFYREN APPROACH

**At AFYREN we are committed to producing 100% biobased products from renewable raw materials through a fully dedicated process that follows the segregated biobased chemistry approach.**

According to the norm EN 16785-1, a biobased product is a product which is entirely or partially made from biomass. It is as simple as this: a product can be claimed as 'biobased' only if the raw materials used are physically integrated in the final products. Because we believe it is the most sustainable way to produce molecules from renewable raw materials, the AFYREN model is focused on biobased segregated chemistry (see figure 2).

Only because of this process, we are in the unique position to provide 100% biobased Carboxylic Acids (C2 to C6) to the market. That means all the molecules' carbon atoms originate from the biomass, instead of possible fossil origin. As opposed to other approaches where the actual content of biomass can only be calculated theoretically, the biogenic carbon content (or biocontent) in AFYREN products can precisely be determined and checked by the well-known C14 radiocarbon dating method. AFYREN can also provide results of this analysis for each acid.

At AFYREN, we go even further to select sustainable feedstocks, using several key criteria (renewable raw materials are not all equally sustainable):

We believe that even in globalized industries, local sourcing is crucial to contributing to a sustainable world. This is why we source our renewable raw materials from local European suppliers within proximity of our commercial plant located in North Eastern France. Knowing where the raw material is coming from allows us to select only materials that do not compete with the global food chain.

The versatility of our process allows us to choose the most appropriate feedstock depending on the region where we operate.

In an effort to preserve natural resources, all raw materials used by AFYREN are biomass by-products. This avoids cultivating specific crops solely for the sake of consumption in a biobased production process. It also maximizes value from available farmland without putting additional pressure on land use and biodiversity.

Finally, our segregated system and our relationships to nearby suppliers allows us full traceability and transparency for our customers.

**In order to help consumers make the right choice, it is the responsibility of the whole value chain to ensure the sustainable sourcing and production of their products, with traceability and transparency and clear information available to the public.**

All these concepts have a real utility and make some sense. But to avoid any confusion and help consumers make a deliberate choice, it is very important that a product's claims reflect its chain of custody.



### ABOUT US

To meet a growing need among industries to reduce the use of petroleum derivatives in their production chain, AFYREN makes biomolecules derived from the reuse of non-food biomass. These ingredients are widely used in human and animal nutrition, flavors and fragrances, cosmetics, and fine chemicals. This production of renewable carbon, which is firmly grounded in the circular economy, uses fermentation technologies that are the result of 10 years of research and are patented worldwide. Founded in 2012 and led by Nicolas Sordet and Jérémy Pessiot, AFYREN has about 45 employees at its sites in Lyon, Clermont-Ferrand and Carling - Saint Avold, France. AFYREN is a winner of the Concours Mondial d'Innovation 2030 in the "Plant proteins and plant chemistry" category and was included in the French Tech 120 in 2020 and 2021. In 2018, AFYREN committed to its industrial project by creating the AFYREN NEOXY joint venture with Bpifrance's SPI fund. The AFYREN NEOXY factory will be a pioneer in the industrial-scale production of natural organic acids.

### REFERENCES

<https://www.ellenmacarthurfoundation.org/assets/downloads/Mass-Balance-White-Paper-2020.pdf>

[https://www.plasticseurope.org/download\\_file/force/3390/746\\*](https://www.plasticseurope.org/download_file/force/3390/746*)

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