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Biomass-Based Solid Fuels Production

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Forestry and Habitats Online Knowledge Exchange Workshop

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Biomass-Based Solid Fuels Production

Biomass Supply

Bioenergy makes up the majority (55,7%) of renewable energy in the EU and is its largest indigenous energy source.

Bioenergy works by transforming the potential ENERGY STORED in BIOMASS into useful heat and electricity.

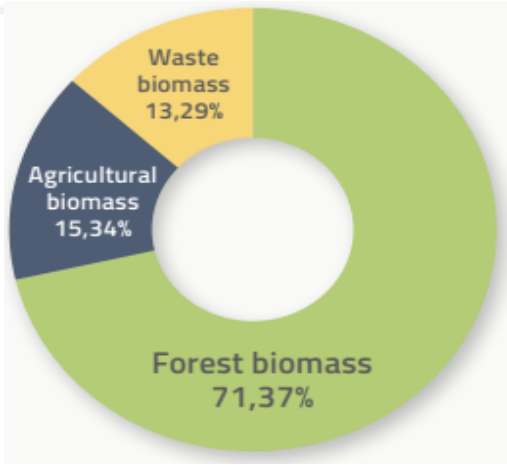

Figure 1 - Distribution of the various biomass feedstock for energy in 2021 (Adapted from Eurostat estimate)

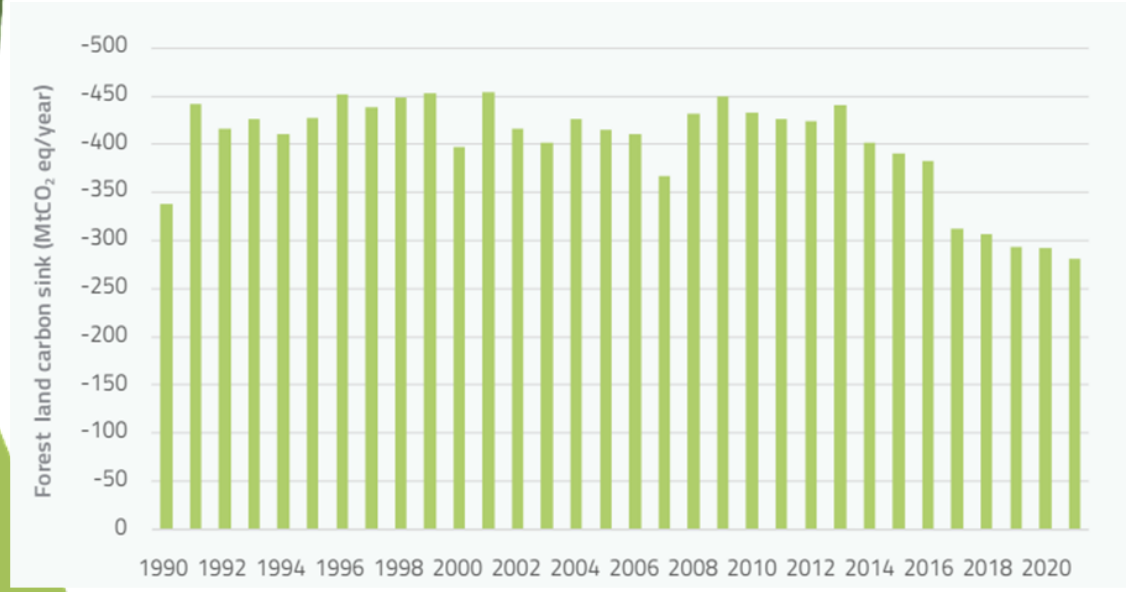

Figure 2 - Forest land carbon sink in the EU, MtCO2eq (adapted from EEA)

Recently, the EU's Forest carbon sink has faced significant challenges...

A decrease in the period between 2010 and 2020,can be seen!!!

Factors that contributed to this decline were: fires, droughts, storms, insect outbreaks, etc., the aging of these ecosystems, reducing the carbon absorption and increased wood harvesting.

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The potential for biomass supply in Portugal is remarkable!

Agriculture and Forestry were installed in 73% of the territory

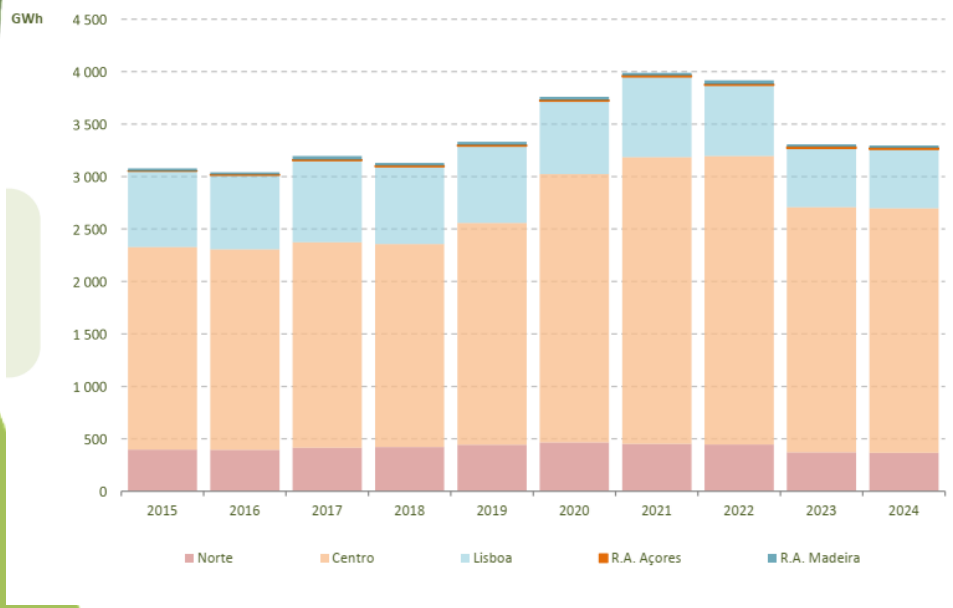

Figure 4 - Production of electrical energy from biomass (Adapted from DGEG 2022)

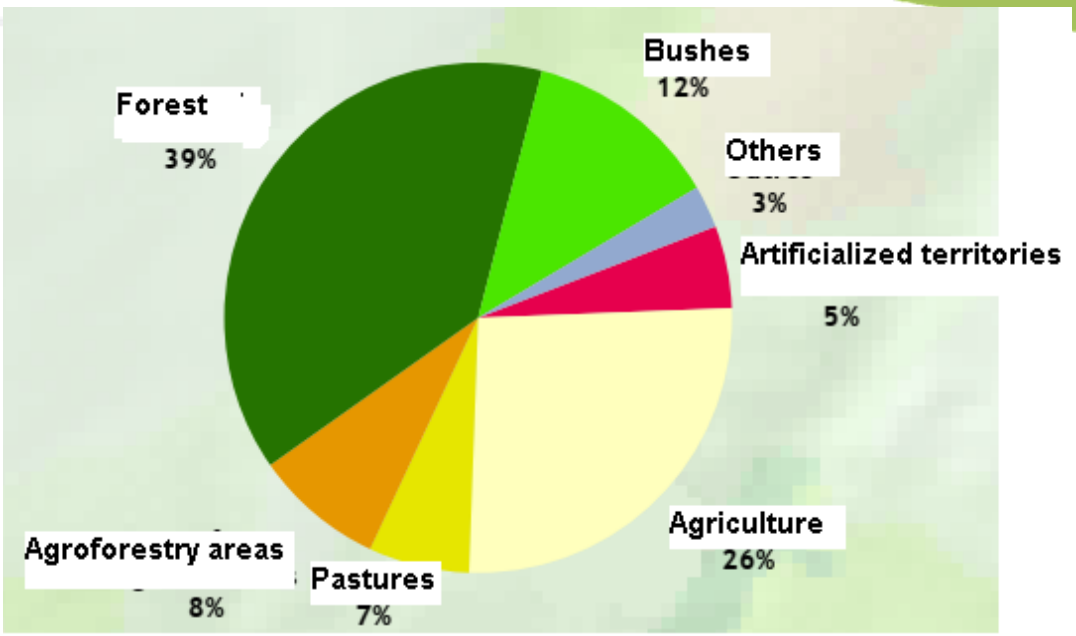

Figure 3 - Occupation and use of Portuguese land in 2018 (Adapted from DG Território 2022)

71% of electricity produced from biomass, is located in the central region.

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Biomass-based solid fuels are a sustainable and renewable source of energy that can help reduce our dependence on fossil fuels.

One of the key advantages of these fuels is their carbon-neutral nature.

When burned these fuels released carbon dioxide into the atmosphere.

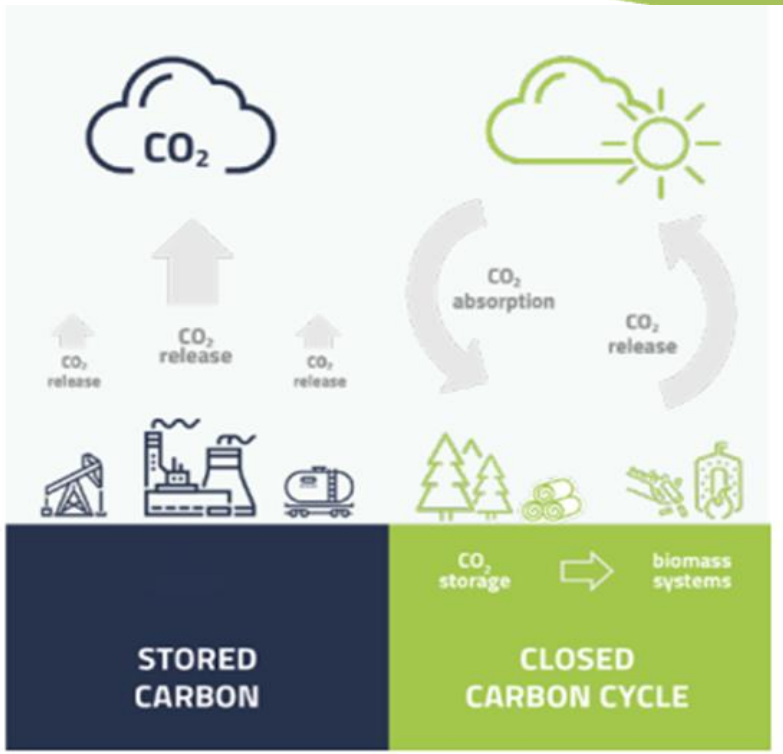

Figure 3 - Biogenic versus fossil carbon (adapted from Bioenergy Essentials)

However, this carbon dioxide was originally absorbed by the plants during photosynthesis

There are several technologies available for converting biomass into solid fuels..
Some of the most common technologies include **pyrolysis**, **torrefaction**, and **PELLETIZATION**.

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These solid fuels are produced from organic materials such as wood, crop residues, and waste from agricultural and forestry activities..

In our lab, pellets were produced from: shrubs (Cytisus, Cistus, Acacia dealbata), Miscanthus, Arundo donax, Populus alba, Salix, Pinus pinaster,Eucaliptus glóbulos,RDF-refuse derived fuel, pig and chicken waste, rabbit skin, waste vines and kiwi, hazelnut and walnut shells, olive pits, etc.

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Pelletization

The production of pellets involves several steps:

First, the raw biomass materials are collected and processed to remove any impurities such as rocks, soil, and reduce particle size and shape.

Once the raw materials are cleaned, they are then dried to reduce their moisture content to an optimal level.

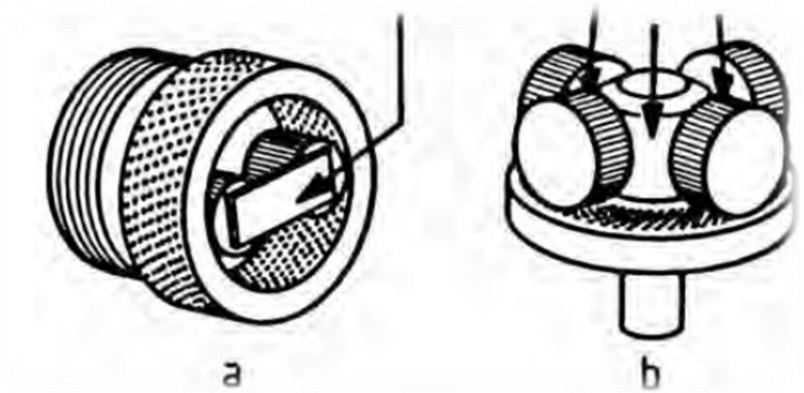

Figure 4- Designs of pellet mills

Next, the dried biomass materials are compressed into solid fuel pellets or briquettes.

This compression process increases the energy density of the biomass materials, making them more efficient and easier to transport and store.

Figure 5- Cooling pellets

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Pelletization

Pelletization has to be performed at temperatures between 80 and 200 ºC, to ensure lignin softness and plastic deformation, leading, after cooling, to stronger particle bounding.

Raw-material (sawdust) moisture content should be between 8 and 12%.

The particle size influences the durability of pellets; the smaller the particle size, the greater the pellets durability..

Pellets of good durability should be obtained from an average size between 0.5 and 0.7 mm, which usually appears as a breaking point from the above dimensions of
1.0 mm

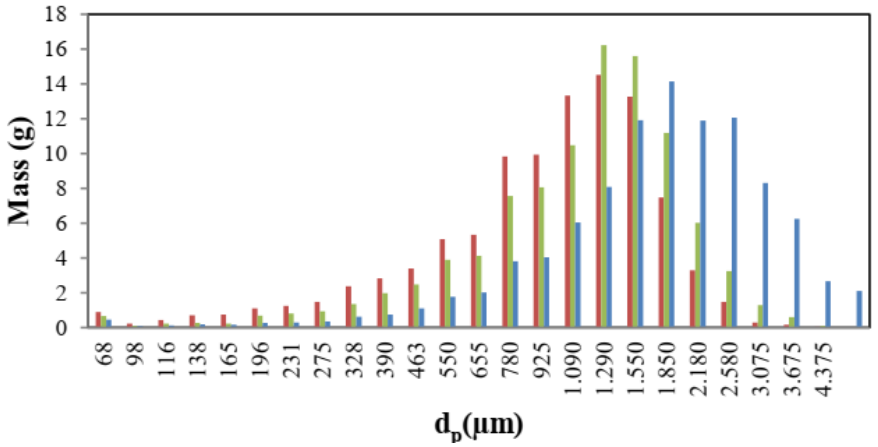

Figure 4- Sieving results – mass vs mean diameter

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Thank you for your attention

Feel free to ask questions

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