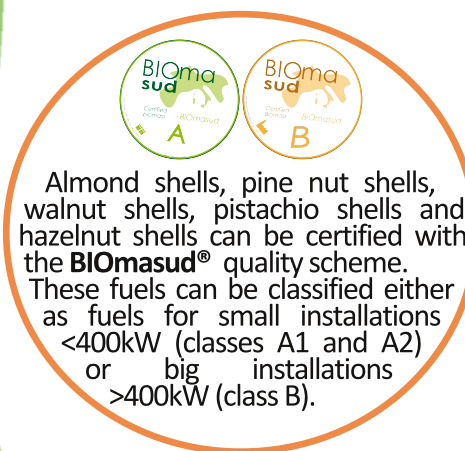
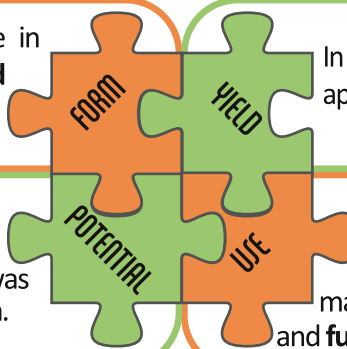


The Mediterranean countries are producing solid biomass fuels such as olive stones and almond shells that aren't available in other European regions. Nut shells are a by-product of the nut hulling industry. Cracked nut shells are separated from the nut meat using aspirators. Nut shells are a lignocellulosic residue with energy content comparable to other biomass fuels and low moisture and ash contents. These properties make nut shells a very attractive fuel for domestic heating.



These types of agroindustrial residues are in most cases available in the form of **crushed granular fuel**.

For 2015, Biomassud Plus project estimated that the annual potential for **nut shells** in Spain, Portugal, Italy and Greece was approximately **270,000 dry tonnes per annum**.



In most cases, the **nut shell** represents approximately **50% of the total weight of the nut**.

Nut shells are used for **heating purposes** either in domestic or industrial applications. In addition, they are a source of chemical raw material for the production of **activated carbon** and **furfural**.

Indicative fuel properties and BIOMASUD® label quality class limits* (v15.0)

Property	Units	Almond shells**	Almond / Hazelnut shells			Pine nut shells			Pistachio shells			Walnut shells		
			Class A1 / A2 / B			Class A1 / A2 / B			Class A1 / A2 / B			Class A1 / A2 / B		
Moisture content	w-% a.r.	11	≤12	≤12	≤16	≤12	≤12	≤16	≤12	≤12	≤16	≤12	≤12	≤16
Ash content	w-% d.b.	1.6	≤0.7	≤1.5	≤2.0	≤1.3	≤1.6	≤2.0	≤0.7	≤1.6	≤2.0	≤0.7	≤1.6	≤2.0
Net Calorific Value	MJ/kg a.r.	16.1	≥15.0	≥15.0	≥14.2	≥16.0	≥16.0	≥15.2	≥15.0	≥15.0	≥14.0	≥16.0	≥16.0	≥15.0
Bulk density	kg/m³ a.r.	410	≥500	≥300	≥270	≥470	≥470	≥450	≥300	≥300	≥270	≥250	≥200	≥200
N	w-% d.b.	0.4	≤0.4	≤0.6	≤0.8	≤0.4	≤0.4	≤0.8	≤0.4	≤0.6	≤0.8	≤0.4	≤0.6	≤0.8
S	w-% d.b.	0.01	≤0.03	≤0.03	≤0.04	≤0.03	≤0.03	≤0.05	≤0.03	≤0.03	≤0.05	≤0.03	≤0.03	≤0.05
Cl	w-% d.b.	0.02	≤0.02	≤0.02	≤0.03	≤0.02	≤0.04	≤0.06	≤0.02	≤0.03	≤0.04	≤0.02	≤0.03	≤0.04
Ca	mg/kg d.b.	1300	a.r.: as received d.b.: dry base											
K	mg/kg d.b.	4600												
Na	mg/kg d.b.	2500												
Si	mg/kg d.b.	630												

* Please note that the given limits are only indicative of the quality requirements of the BIOMASUD® scheme.

**Agrobiomass composition can vary significantly. The given values are only indicative of typical values for this type of agrobiomass. More information on the typical variation of olive stones can be found in Annex B of EN 17225-1 and deliverable D3.2 of the Biomassud Plus project.

Image sources: hazelnut shells - www.rosariumgardencenter.com, pistachio shells - www.creativemarket.com, walnut shells - www.mercadolibre.cl, pine nut shells - www.avito.ru, almond shells - www.pelletsdelur.com



This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement No 818369. This document reflects only the author's view. The Innovation and Networks Executive Agency (INEA) is not responsible for any use that may be made of the information it contains.

Find out more about
nut shells heating and
use cases, fuel suppliers
etc. in AgroBioHeat's
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