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Handbook for the BIOmasud Solid Biofuels Certification v15 - Producers

http://biomasud.eu

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1 BACKGROUND AND SCOPE

Biomasud certification system was developed in a project inside the frame of the program Interreg IV B, financed with funds FEDER. This last version of the Handbook v15 was made within the project BIOMASUD PLUS which is funded in the H2020 program (Grant Agreement no. 691763).

The Mediterranean countries have a biomass market with production of solid biomass fuels such as olive stones, almond shells and pine nut shells that aren't used in other European regions. As a result, there are already some national or European quality labels for wood pellets but there is nothing for other kind of solid biofuels. Biomasud chases the ultimate goal of contributing to the sustainability of the solid biomass-based energy model and consequently the conservation of the natural environment of the Mediterranean region, promoting efficiency and sustainability in the processes. To achieve this goal within the project was developed the certification system Biomasud which cover many of the solid biofuels traded in the Mediterranean region

The present handbook establishes the procedures of a quality and sustainability certification system. This scheme has **quality requirements** but also it will have **minimal sustainability criteria** along the whole chain of value, and a **traceability system** that allows managing the resources from a global perspective.

The main scope of the label is the solid biofuels for non-industrial purposes that will be used in small-medium boilers, stoves, or bigger installations but with a need of quality guaranties because of its location (i.e. district heatings located inside the towns). During the creation of the Biomasud quality label knowledge of other quality systems in Europe was made (i.e. ENplus for wood pellets, managed by the European Pellet Council). It's not the intention of Biomasud consortium to compete with other quality systems already on the market so it was decided to focus in other Mediterranean biomass solid fuels and recognise other certification systems if producers report the complementary information not included in its other certification. Every case will be studied and desided what extra information is needed for conceding the Biomasud seal.

The following Solid biofuels can obtain the Biomasud Quality and Sustainability label (they are divided into two categories: Domestic for small installations (<400 kW) and Domestic for big installations (>400 kW)):

<u>Domestic for small installations (<400 kW)</u>

- Wood pellets (classes A1, A2)

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- Wood chips (classes A1, A2)
- Firewood (classes A1, A2)
- Olive stones (classes A1, A2)
- Pine nut shells (classes A1, A2)
- Almond shells (classes A1, A2)
- Chopped pine cone (classes A1, A2)
- Hazelnut shells (classes A1, A2)
- Pistachio Shells (classes A1, A2)
- Walnut Shells (classes A1, A2)
- Olive tree prunings (classes A1, A2)

- Blends of the cited biomasses (producer must specify the %). (only blends among solid biofuels for small installations are considered. If blended with a solid biofuel for big installation is made, the blend it will be considered a solid biofuel for big installation)

Domestic for big installations (>400 kW)

- Wood pellets (class B)
- Wood chips (classes B1, B2)
- Olive stones (class B)
- Pine nut shells (class B)
- Almond shells (class B)
- Chopped pine cone (class B)
- Hazelnut shells (class B)
- Pistachio Shells (class B)

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- Walnut Shells (class B)
- Vineyard prunings (Classes PI1, PI2, PI3)
- Olive tree prunings (Classes P1, P2, P3)
- Blends of the cited biomasses (producer must specify the %). (only blends among solid biofuels for big installations are considered. If blended with a solid biofuel for small installation is made, the blend it will be considered a solid biofuel for big installation)

Other biomasses could be accepted if its quality is acceptable as domestic and fulfil the requirements of any cited biomass. The capacity to admit more biomasses is held by Biomasud steering committee.

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2 NORMATIVE REFERENCES

CEN/TC 15370-1: Solid biofuels - Method for the determination of ash melting behaviour - Part 1: Characteristic temperatures method

ISO 14780: Solid Biofuels – Sample preparation

EN-ISO 18135: Solid biofuels - Sampling

EN 15234-2: Solid biofuels - Fuel quality assurance - Part 2: Wood pellets for non-industrial use

ISO 3166: Codes for the representation of names of countries and their subdivisions

ISO 16948: Solid biofuels - Determination of total content of carbon, hydrogen and nitrogen contents

ISO 16968: Solid biofuels - Determination of minor elements

ISO 16994: Solid biofuels - Determination of total content of sulphur and chlorine

ISO 17225-1: Solid biofuels - Fuel specifications and classes - Part 1: General requirements

ISO 17225-2: Solid biofuels - Fuel specifications and classes - Part 2: Graded wood pellets

ISO 17225-4: Solid biofuels - Fuel specifications and classes - Part 4: Graded wood chips

ISO 17225-5: Solid biofuels - Fuel specifications and classes - Part 5: Graded firewood

UNE 164003: Solid biofuels – Fuel Specifications and classes. Graded olive stones

UNE 164004: Solid biofuels – Fuel Specifications and classes. Graded fruit shells

ISO 17828: Solid biofuels - Determination of bulk density

ISO 17829: Solid Biofuels - Determination of length and diameter of pellets

ISO 17831-1: Solid biofuels - Determination of mechanical durability of pellets and briquettes - Part 1: Pellets

ISO 18122: Solid biofuels - Determination of ash content

ISO 18125: Solid biofuels - Determination of calorific value

ISO 18134: Solid biofuels - Determination of moisture content -

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ISO 18846: Solid biofuels - Determination of fines content in quantities of pellets

ISO 9001: Quality Management Systems – Requirements

ISO/IEC 17020: Conformity assessment - Requirements for the operation of various types of bodies performing inspection

ISO/IEC 17025: General requirements for the competence of testing and calibration laboratories

ISO/IEC 17065: Conformity assessment - Requirements for bodies certifying products, processes and services

EN 45011, General requirements for organisations that operate product certification systems

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3 DEFINITIONS OF TERMS

3.1 OWNERS OF THE SCHEME – NATIONAL LICENSERS

Nowadays, the owners of the license for the Biomasud's Quality and Sustainability label are members of the Biomasud's project consortium that decided to continue with the implementation of the system: AVEBIOM (Spain), CIEMAT (Spain), CBE (Portugal) and CVR (Portugal).

With the BIOMASUD PLUS project, new National Licensers are most probably going to join the scheme for the new countries where it will be present (ZEZ from Croatia, CERTH from Greece, AIEL from Italy, SFI from Slovenia and Tubitak from Turkey) after the termination of the project (December 2018)

The owners of the scheme and National Licensers forms the Biomasud's steering committee which will manage the label.

3.2 LABEL ISSUER – CERTIFICATION BODY

The certificate is issued by an independent third party entity. The Biomasud steering committee is the organ who decides which entity will be able to issue the label. In every country of the Mediterranean region, one entity or two could be designed for that issue. The requirements for Certification Bodies are stated in the handbook's part for Independent Bodies

Out of the Mediterranean region, a producer or trader wishing to obtain the label must deal directly with the Biomasud steering committee.

3.3 INSPECTION BODIES

The Inspections bodies must be accepted by the Biomasud steering committee who will publish on its WEB the list of accepted testing bodies for verifying within the Biomasud system. The requirements for Inspection Bodies are stated in the handbook's part for Independent Bodies

3.4 TESTING BODIES

The testing bodies must be accepted by the Biomasud steering committee who will publish on its WEB the list of accepted testing bodies for verifying within the Biomasud system. The requirements for Testing Bodies are stated in the handbook's part for Independent Bodies

3.5 LABEL HOLDERS

Label holders are companies that produce solid biomass or trade them, and have committed themselves in a contract with the label issuer to follow the regulations of the Biomasud's

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certification system. They have been certified according to the rules of this handbook. They can be of the following type depending on the activity they make:

Certified Producer: a company that produces solid biofuels under the scheme and sells it in bags or to a trader. A producer doesn't need to be the facility producing the raw material (an oil industry or almond shell splitter for example) but the company which is processing it (cleaning, drying, sieving…) the same way that for example a wood pellet factory is buying saw dust and producing pellets.

Sustainable Forest Management (SFM) requirements are required for big producers. Big producers are the ones producing more than 30.000 tonnes based on previous year production. For the first year of certification the estimation will be valid. If the estimation are overpassed the sustainability requirements won't be required retroactively but they will be forced to fulfil for the next year

Certified Trader: a company that make the logistic and deliver of certified solid fuels to final users. Certification is obligatory to traders dealing with bulk format. If the trader is dealing with bag formats, certification is not necessary.

Certified Producer and Trader: a company that have both profiles; Producers solid biofuels under the scheme and Traders making logistic and deliveries selling to final users in bulk. Inspectors must verify both scopes.

Lot / Batch: Every biomass production facility must define its batch size in its internal quality system which is the final product quantity manufactured in the same conditions (same raw material, machine configuration, etc.).

3.6 EUTR Definitions

EUTR operator means any natural or legal person that places timber or timber products on the (EU) market

EUTR Trader means any natural or legal person who, in the course of a commercial activity, sells or buys on the (EU) internal market timber or timber products already placed on the internal market

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4 CERTIFICATION SYSTEM

4.1 OVERVIEW

The essential components of the certification programme are:

- **Quality requirements**. It will be verified that the product fulfils the quality required for obtaining Biomasud label. The Inspection body is responsible for sampling and the registered Testing body of analysing it. The Testing body will come back to the Inspection body with the analysis report. In addition the Inspection Body will verify that the company's facilities fulfils the basic requirements to obtain and maintain the product Quality. Quality product requirements are described in Chapter 5 and tables with product parameters in annexes 1 and 2.
- **Sustainability criteria**. 6 minimum sustainability criteria are established by the label, two of them for all the solid biofuels covered by the system (GHG and Energy Consumed), and four of them which are adapted to the origin and the kind of raw material (Legality of raw material, Sustainable forest management, Carbon stock and Land use). Sustainable Management are applied to big producer (from 30.000 tonnes). The Inspection Body will verify the fulfilment of the required criteria in the Chapter 6.
- **Traceability system**. One of the main parts of the system is the traceability which helps to warrant the quality and the sustainability criteria of the biomass. Inspection body will verify that the producer / trader fulfils the requirements established by the label and described in chapter 7).

4.2 OBTAINING THE LABEL

The interested company, producer or trader, fills in an application form which can be found on Biomasud WEB site (biomasud.eu) or through the *owners of the scheme*. The label issuer is responsible in the country where (the headquarters of) the applicant is located. The respective organization has to take a decision on the application within 2 months.

The documents to be submitted are:

- Application form
- Inspection (from a listed inspection body) and testing report (from a listed testing body) of the initial inspection

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The report of an initial inspection in accordance with this quality label programme has to be presented to the label issuer.

If a pellet company producer is certified with ENplus® it will be enough for obtaining the Biomasud Certification by presenting:

- Their ENplus valid certificate.
- The analysis of the last ENplus's audit
- Audit of the Sustainability Criteria as per the Chapter 6 by a registered Inspection Body.
- In addition, this company will have to comply with the Biomass traceability system, so they will proceed as indicated in Chapter 6

4.2.1 Mandate for Production Control

The interested company enters into an inspection contract with an inspection body listed by Biomasud steering committee and commissions it with the initial inspection of its production facilities.

4.2.2 Initial Inspection of a producer

The inspection body and testing body conducts an initial inspection of the production site(s) of the interested party, where the following points are to be examined:

- Raw material: Classification of the origin and sources of solid biofuels in accordance with EN ISO 17725, Solid biofuels – Fuel specification and classes – Part 1: General requirements.
- Type, exact description and quantity of additives[1] (e.g. pressing aids, slagging inhibitors), if they are used.
- Type and suitability of the raw material storage.
- Production plant: Suitability of the technical facilities in order to be able to produce domestic quality biomass.
- Type and suitability of the product storage.
- Sustainability criteria in accordance with Chapter 6.

[1] Additive is a material, which improves the quality of the fuel (e.g. combustion properties), reduces emissions or makes production more efficient.

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- Quality management system (in accordance with Chapter 8): in-house manual and/or operating instructions, training records (external and internal), handling of claims and complaints, etc.
- Self-monitoring of production, suitability and condition of the testing devices, reference sample management.
- Product declaration: specify the biofuel or biofuels which are requested to obtain the label.

At the initial inspection, the following tasks must be carried out by the site auditors:

- Sampling from production/storage, description, respectively, photo documentation of the sampling points; the sampling has to be carried out in accordance with EN 14778. The sample shipping to the testing body must be arranged by the inspection body and the sample should be guarded by them until it is shipped. The analysis report has to be forwarded to the applicant and, in copy form, to the label issuer and to the inspection body.
- Inspection of the plant's own sampling procedures for internal quality testing; if necessary, training in representative sampling, including suggestions for improvement.
- Examination of the production process and quality management documentation; these documents are to be treated confidentially by the inspection body and are not allowed to be passed on to third parties (exceptions are justified inquiries of the label issuer).

The inspection body will be able to access to all parts of the plant and all relevant documentation.

The initial inspection report (including the laboratory results) has to be forwarded to the applicant and, in copy form, to the label issuer.

If minor non-conformities are found during the inspection or laboratory test, the inspection body sets a commensurable deadline for corrective measures; the applicant has to prove that adequate corrective measures have been taken within the deadline (this deadline will be establish by the inspection body, it's recommended is about 30 days).

When major non-conformities have occurred, a completely new audit has to be conducted after the defects have been corrected. Major non-conformities that can influence the production

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quality on a sustained basis are e.g. inappropriate raw material or defective production and storage facilities. Major non-conformities can have a direct or indirect influence on the operating performance of equipment using biomass produced under these conditions.

4.2.3 Issuing the label

The label issuer body verifies the conformance of the company's product and installations to the Biomasud quality label guidelines based on the following information:

- in the initial application form.
- in the inspection report of the inspection body.
- in the laboratory report with the results of the produced solid biofuels

If the application is approved, the applicant is informed and receives the Biomasud's certification contract and a request for submitting the payment of the license fee. When proof of the payment of the license fee has been received and the signed contract has been returned, label is carried out by sending the documentation with the identification number and the validity period of the label.

The company will be entered into a register with all other companies which have obtained the label, which is to be accordingly published on the websites of the national label issuer and the Biomasud WEB site.

4.2.4 Surveillance inspections

Each production facility has to be inspected annually by the inspection body in accordance with the requirements stated in this manual. The inspection body will take a sample and will send it to the testing body who will analyse it. The inspection body must keep custody of the sample and send it by courier or by other means under its presence.

Firewood producers has to be inspected with less periodicity. They have to make initial inspection, another in the period of certification (between 2 and 4th year) and then in the renovation inspection before the end of the 5th year. After the initial period, they have to do inspections in renovation inspections and another in the period of certification (between 2 and 4th year).

The Certification Body or the National Licenser can carry out unannounced inspections in case of suspicions.

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Improvements and changes in the certification system (for standards, quality management, etc.) are to be brought to the attention of the person responsible for quality management in the plant by the supplier of the label (national label issuer or Biomasud steering committee).

When defects or deviations from the Biomasud quality label regulations are found in the plant or in the laboratory test during the periodic inspection, the accredited inspection body/testing body has to immediately inform the label holder. When minor deviations occur, the accredited inspection body/testing body can set a reasonable grace period (a maximum, however, of 10 weeks), in which the label holder must show that corrective measures have been taken. The label issuer does not need to be informed.

When major defects have occurred, the label issuer has to be immediately informed by the inspection body/testing body. The label issuer is entitled to order a completely new monitoring inspection after the defects have been corrected. Major defects that can influence the production quality on a sustained basis are especially considered such us inappropriate raw material or defective production and/or storage facilities.

4.2.5 Application Procedure

The interested company submits an application form to the label issuer (national label issuer or Biomasud steering committee) expressing its interest in obtaining the quality label and declares himself/herself willing to observe the regulations of the quality label system. The label issuer makes a decision on the application within 2 months.

When a positive decision about the application is made, the applicant completes a contract with the certification body, which enables it, if necessary, to mandate an inspection by a listed testing centre.

4.2.6 Issuing of the quality label

On the basis of the information provided in the application, the label issuer examines the conformance to the quality label guidelines. If the application is approved, the applicant is informed. As soon as the proof of the down payment of the license fee to the national label issuer or Biomasud steering committee has been received and the signed quality label contract has been returned, the quality label is carried out by sending the label documentation with the identification number and the validity period of the label. In addition, the label holder will be entered into a register with all the other label holders, which will be published on the Biomasud WEB site

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4.3 Objection Proceedings

Applicants and label holders can send a written objection to the label issuer body against the following decisions:

- Refusal of the requested label concession.
- Ordering of new monitoring inspections.
- Ordering of extraordinary inspections (see 4.9).
- Ordering of more frequent inspections in the scope of internal controls.
- Suspension and cancellation of the label license (see 4.4).
- Public mentioning of grievances (see 4.4).

The objection is only permissible when the applicant or label holder proves that the affected decision violates his/her own rights. A written decision on the objection will be made within two weeks by an objection committee to be set up by the national label issuer / Biomasud steering committee. No persons who have definitively been affected by the objection decision can participate in the decision-making process.

4.4 Validity of the Certificate

Validity of the quality label is five years.

In the case of biomass producers an **annual inspection** and **test** must be carried out. If the annual inspection and test are under Biomasud label requirements no action must be done by label holder and label issuer must inform to the label holder.

When conscious violations of the regulations of this quality label system occur or when noticed non-conformities continue despite repeated demands to remedy these, the national label issuer / Biomasud steering committee has to suspend the license to use the Biomasud label for a limited period or terminate the contract and request the label issuer to revoke the label. If the label holder has several locations, the license can be suspended for the location where the defects have been assessed until they have been corrected. Biomass products from other locations of the label holder can still be marketed as labelled goods.

In the case that the license and the label is revoked, the former label holder can re-apply for certification and license after being verified by the label issuer to be adequate and sufficient.

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In addition, the national label issuer / Biomasud steering committee is authorized to publicize the objections on the Internet in an appropriate manner and to name the affected label holder.

4.5 Major Changes

The label holder has to immediately report major changes to the label issuer body. Major changes are all changes of the technical equipment as well as the operation processes or the company structure and rules that have to be reported during the Biomasud's quality label application process.

4.6 Use of the Quality Label

When the label is issued, the label holder acquires the right to use the quality label seal for the corresponding quality class to label its products and for advertising purposes. The seal may be exclusively used in direct connection with the certified product, respectively, the certified service (transport, storage). Label holders, who manufacture quality labelled and non-labelled goods, have to avoid the impression that the complete production and trade quantities have the quality label. The certification seal may only appear on invoices when these invoices are issued for Biomasud labelled goods.

The Biomasud's certification seal and/or the name of the biomass certified biomass with Biomasud word in the description of the goods (i.e. Biomasud olive stones) must appear on the invoices when these invoices are issued for Biomasud labelled goods.

The quality label seal will be linked to the identification number of the label holder. Use of the seal without the combination with the identification number is only possible with the permission of the national label issuer / Biomasud steering committee.

However, trading with Biomasud quality labelled bagged products is permissible without having the label. In combination with the identification number of a Biomasud labelled-supplier, the not labelled trader can declare the goods as Biomasud quality labelled on the bill.

4.7 Labelling

Each sales unit of labelled Biomasud products according to this system has to be labelled with the following specifications. Bagged products:

- Product classification; label must indicate which kind of biomass is according to the tables of annex 1 or 2.
- Biomass quality; label must indicate the quality classification according to tables of annex 1 or 2.

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- Quality label seal.
- Mass (in kg or ton)
- The Biomasud's certification seal and/or the name of the biomass certified biomass with Biomasud word in the description of the goods must appear on the invoices when these invoices are issued for Biomasud labelled goods.
- Traceability identification number (see chapter 7).
- Note: Store in dry conditions.
- Note: Use only in approved and appropriate firing units according to manufacturer´s information and national regulations.

For bulk biomasses, the bill must indicate **mass** (in kg or ton) and biomass **class** (i.e. Olive Stones) and **quality** (A, B, etc.).

4.8 Interfaces

Every actor in the production and supply chain guarantees the quality under the Biomasud quality label requirements in his/her area of responsibility. When service providers are engaged, the contracting entity is responsible for adhering to the regulations of this quality label system. The interface to the end consumer is the blow-in nozzle or delivery of the biomass product at the customer's storage.

4.9 Reference Samples

Producers must conserve at least 1 kg of sample every produced batch[2] as reference sample. The production date & lot, product type and product quality must be noted.

Additionally, when deliveries in bulk are made, a 1 kg sample must be taken. The delivery date & lot, product type and product quality must be noted. When there are several deliveries from the same batch the same day, there is no need to take more samples.

The samples have to be archived for at least 2 months under proper conditions. The object of keeping the sample is to use it in case of complaints.

Firewood producers are exempted of taking and gathering reference samples. Only registers of

[2] Every biomass production facility must define its batch size in its internal quality system which is the final product quantity manufactured in the same conditions (same raw material, machine configuration, etc.)

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the self-inspections are mandatory (see Chapter 8.1.5)

4.10 Regular and extraordinary audits

One annual audit is mandatory for producers (except Firewood producers that has to be inspected with less periodicity, see Chapter 4.2.4).

In addition to that, extraordinary audits can be carried out upon demand by the label issuer, owners of the scheme or the Biomasud steering committee if significant number of complaints have been received or have information showing that there are non conformities or fraudulent use of the label. This audit can be unannounced.

If major non-conformities have occurred, the inspection body has to immediately inform the label holder and the label issuer. In this case, the label issuer is authorized to mandate a new inspection after the defects have been corrected. Major defects that can influence the production quality on a sustained basis are especially considered to be inappropriate raw material or defective production and storage facilities.

When conscious violations occur, the regulations stated in 4.4 are applicable.

4.11 Complaint Procedure

When customers or subordinate actors make complaints, the label issuer will pursue these on the basis of the supply chain documented by the identification number. The complaints will be handled by national rules and the in-house documentation of the involved actors will be inspected by label issuer.

Complaints will be acknowledged if storage installations are designed according to National requirements.

Furthermore, at least one of the following preconditions must be fulfilled:

- One sample, which was drawn in the presence of all involved parties (customer/ dealer/ installer/ service technician), was examined by a listed testing body and does not conform to the chemical and physical characteristic values (see the tables in annex 1).
- The average fine material quantity in the storage area exceeds 10% and the boiler combustion shows clear signs of malfunction due to this. There must only have been used 20% of the silo load since the last silo filling. A sample is drawn

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in presence of the involved parties and examined by a testing body as mentioned beforehand. If possible a representative sample must be taken in a falling stream between silo and boiler, and must consist of 3 individual samples which are mixed afterwards.

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5 PRODUCT QUALITY

The scope of this quality label is to assure the quality of the biomasses used for domestic purposes in the Mediterranean region. They are divided into two categories: Domestic for small installations (<400 kW) and Domestic for big installations (>400 kW). The biomasses covered by the Biomasud certification system:

Domestic for small installations (<400 kW)

1. **Wood pellets**. Quality specifications according to classes A1 & A2 of ISO 17225-2. See Annex 1 table 1 for thresholds.

2. **Wood chips**. Quality specifications according to classes A1 & A2 of ISO 17225-4. See Annex 1 tables 2.1 and 2.2 for thresholds.

3. **Firewood**. Quality specifications according to classes A1 & A2 of ISO 17225-5. See Annex 1 table 3 for thresholds.

4. **Olive stones**. Quality specifications based on classes A1 & A2 of UNE 164003 and updated with BIOMASUD PLUS project deliverable D3.3. See Annex 1 table 4 for thresholds.

5. **Almond / Hazelnut shells**. Quality specifications based on classes A1 & A2 of UNE 164004 and updated with BIOMASUD PLUS project deliverable D3.3. See Annex 1 table 5 for thresholds.

6. **Chopped pine cone**. Quality specifications according to classes A1 & A2 of UNE 164004. See Annex 1 table 6 for thresholds

7. **Pine nut shells**. Quality specifications based on classes A1 & A2 of UNE 164004 and updated with BIOMASUD PLUS project deliverable D3.3. See Annex 1 table 7 for thresholds

8. **Pistachio shells.** Quality specifications of classes A1 & A2 according to deliverable D.3.3. of BIOMASUD PLUS project. See Annex 1 table 8 for thresholds

9. **Walnut shells.** Quality specifications of classes A1 & A2 according to deliverable D.3.3. of BIOMASUD PLUS project. See Annex 1 table 9 for thresholds

10. **Olive tree prunings (domestic for small installations).** Quality specifications of classes A1 & A2 for chips format and P1, P2 & P3 for pellet format according to deliverable D.3.3. of BIOMASUD PLUS project. It can be in pellet or chips format. See Annex 1 table 10.1 and 10.2 for chips format's thresholds and table 11 for pellet format's thresholds

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Blends of the cited biomasses (producer must specify the %). (only blends among solid biofuels for small installations are considered. If blended with a solid biofuel for big installation is made, the blend it will be considered a solid biofuel for big installation)

Making blends are only allowed to the producers. A trader willing to make blends will have to get certify as Producer

Domestic for big installations (>400 kW)

11. **Wood pellets**. Quality specifications according to class B of ISO 17225-2. See Annex 2 table 12 for thresholds.

12. **Wood chips**. Quality specifications according to class B of ISO 17225-4. See Annex 2 tables 13.1 and 13.2 for thresholds.

13. **Olive stones**. Quality specifications according based on class B of UNE 164003 and updated with BIOMASUD PLUS project deliverable D3.3. See Annex 2 table 14 for thresholds.

14. **Almond shells / Hazelnut shells**. Quality specifications based on class B of UNE 164004 and updated with BIOMASUD PLUS project deliverable D3.3. See Annex 2 table 15 for thresholds.

15. **Chopped pine cone**. Quality specifications according to class B of UNE 164004. See Annex 2 table 16 for thresholds

16. **Pine nut shells**. Quality specifications based on class B of UNE 164004 and updated with BIOMASUD PLUS project deliverable D3.3.. See Annex 2 table 17 for thresholds

17. **Pistachio shells.** Quality specifications. Quality specifications of class B according to deliverable D.3.3. of BIOMASUD PLUS project. See Annex 1 table 18 for thresholds

18. **Walnut shells.** Quality specifications of class B according to deliverable D.3.3. of BIOMASUD PLUS project. See Annex 2 table 19 for thresholds

19. **Vineyards prunings (wood pellet for domestic big installations).** Quality specifications according to classes PI1, PI2 & PI3 of deliverable D.3.3. of BIOMASUD PLUS project. See Annex 2 table 20 for thresholds.

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20. **Olive tree prunings (domestic for big installations).** Quality specifications according to classes P1, P2 & P3 of deliverable D.3.3. of BIOMASUD PLUS project. See Annex 2 table 21 for thresholds.

Blends of the cited biomasses (producer must specify the %). (only blends among solid biofuels for big installations are considered. If blended with a solid biofuel for small installation is made, the blend it will be considered a solid biofuel for big installation)

Making blends are only allowed to the producers. A trader willing to make blends will have to get certify as Producer

Blends between biomasses already inside the system are allowed always that resulting blend is still fulfilling quality requirements (i.e. pine nut shells are usually blended with chopped pine cone). To calculate the thresholds that will be required to the blend a proration will be made. I.e. a company wants to certify a blend between 20% A1 Olive stones (table 3) and 80% A1 Hazelnuts (table 4). The Nitrogen content threshold calculation should be:

$$N\ (20\% \times 0{,}3 + 80\% \times 0{,}4\ ) < 0{,}38\ \text{w-\% dry}$$

Where 0,3 is the limit for Olive Stones and 0,4 is the limit for Hazelnuts

In this case, no quality class A1, A2, B, etc. will be given. In all relevant documents (invoices, bags) will be declared the quality and proportions of the biofuels blended.

Blends with other biomasses not included in the system even if they fulfill the quality requirements must be approved by the Biomasud Steering Committee.

It's obligatory to indicate the percentage of the biomasses used in the blend, introduce this information into the traceability system and write it in the bag / invoice.

Unintentional mixtures are not included in this concept.

Other similar domestic biomasses can be accepted in the quality label if quality specifications are within the limits of any of the biomasses in the system. A communication to the Biomasud Steering Committee and the approval of this committee is required.

If specifications of a similar domestic biomass are not within the limits by few parameters and with values relatively close its inclusion in the system may be studied. A communication to the Biomasud Steering Committee and the approval of this committee is required.

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The relevant quality parameters, the corresponding threshold values, as well as the specifications for the raw materials to be used, are listed in Annex 1.

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6 SUSTAINABILITY REQUIREMENTS

The Biomasud Plus project has studied the production chain of all domestic biomasses included in the quality label and defined biomass categories according to the type of materials.

Table: Biomass categories:

CAT	Biomass Categories	Definition	i.e. Materials
1	Woody biomass from forest and other wooded land management.	Roundwood, Tops, branches, stumps or root systems, trees and primary felling residues sourced directly from forest or other wooded land.	Wood chips, wood pellet, firewood
2	Woody biomass from Urban or Agricultural areas	Roundwood, Tops, branches and trees produced during the course of managing urban areas or agricultural areas. (Trees outside the forest - TOF)	Wood (urban round wood, olive tree prunings, vineyard prunings.), bark
3	Non Wood agricultural residues	Residues directly from agricultural areas. Short rotation crops are excluded, with the exception of the residues hereof.	Stalks, straws.
4	Secondary and tertiary agro-forestry materials	Waste flows and residues from agri-food and wood industry (secondary residual waste) and tertiary residual waste such as post-consumer wood waste.	Pine nut, almond, pistachio shells, pine cones, Corncobs, olive stones.

Considering this, the decision of the Biomass Steering Committee has decided to include six minimum sustainability requirements whose application will depend on the type of Biomass and profile of the company.

The requirements applicable to any biomass are: Greenhouse Emissions (GHG) and the energy consumed for the production of solid biofuel.

GHG (greenhouse gases): The reduction of greenhouse gas emissions derived from the use of fuel in replacement of natural gas will be at least 70%. The emissions produced in the transport of raw materials to the production center and those generated in the process of preparing and conditioning the biofuel are taken into account.

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Energy consumed: The energy used in the transport of raw materials to the production center plus the energy used in the processes of preparation, conditioning of the solid biofuel and transport to the customer cannot exceed 40% of the energy contained in the biofuel based on the Net Calorific Value (as received).

An Online platform has been developed to facilitate the calculation of these two criteria by entering the required data. See Chapter 7

In addition, four other sustainability requirements have been approved whose applicability depends on the type of material: legality and sustainable origin of raw materials.

The **legal Logging** requirement ensures compliance with EUTR legislation in all category 1 materials, forest wood origin. Not being applicable to the other categories, because the legislation does not apply to them either.

In relation to the requirement of sustainable origin of materials, it is intended to ensure that the use of any material has minimized its potential impact on its use. in the case of category 1, forest wood origin, it is necessary to be able to guarantee the sustainable forest origin of these materials and in categories 2, wood of agricultural or urban origin, and category 3, agricultural residues, its extraction is required do not cause an impoverishment of the quality of the soil.

Sustainable Forest Management (SFM) requirements are required for big producers. Big producers are the ones producing more than 30.000 tonnes based on previous year production. For the first year of certification the estimation will be valid. If the estimation are overpassed the sustainability requirements won't be required retroactively but they will be forced to fulfil for the next year

Carbon stock and **Low Indirect Land Use Change (ILUC) risk** Principles will be required only for category 1 biomasses and only for bigger producers. Big producers are the ones producing more than 30.000 tonnes based on previous year production. For the first year of certification the estimation will be valid. If the estimation are overpassed the sustainability requirements won't be required retroactively but they will be forced to fulfil for the next year

Below are detailed for each Sustainability Principle, the criteria that develops it and the indicators that demonstrate its compliance:

Principle 1 GHG reduction

Criterion 1.1 Ensuring GHG reduction

Indicator 1.1.1: The reduction of greenhouse gas emissions thanks to the use of certified biomass as a substitute for natural gas shall be a minimum of 70%. It takes into account the emissions produced when transporting the raw materials to the manufacturing facility and those generated

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in the process of preparing and conditioning the biofuel.

To assess this indicator, companies must enter the data required on the On-line platform which will calculate the GHG savings rate. See Chapter7 about the On-line platform

Principle 2 Energy Demand

Criterion 2.1 Reduced Energy Demand

Indicator 2.1.1 The energy used in transporting raw materials to the production facility and the energy used in the process of preparing and conditioning biofuel may not exceed 40% of the energy contained in the fuel (PCI on wet basis).

To assess this indicator, companies must enter the data required on the On-line platform which will calculate the Energy Demand. See Chapter7 about the On-line platform

Principle 3: Prevention of illegal logging practices - EUTR

Criterion 3.1. Implementation and maintenance of a Due Diligence System (DDS) to ensure compliance with EUTR.

This criterion is only applicable to EUTR operators (as defined in EUTR regulation) of category 1 products. As the EUTR lays down, a DDS is a set of procedures and measures that serve as an instrument to ensure the legality of wood and wood-based product supplies and shall contain:

- Access to data about the supply of timber and timber products, including species and origin.
- Risk assessment, according to the above data and the information listed in the actual EUTR regulation.
- Risk mitigation measures when risk is not assessed as negligible.

Operators may choose to establish their own DDS or use the mechanism established by a monitoring organisation.

To verify with this criterion, one of the following indicators shall be identified:

Indicator 3.1.1 A recognized PEFC, FSC or equivalent certificate is in force. A system different from PEFC or FSC must be declared to the Biomasud Steering Committee through the National Licenser to verify its validity.

Indicator 3.1.2 A Due Diligence system operated by a recognized monitoring organization is in force.

Thus, all entities that are operating a DDS in accordance with the requirements of a recognized Monitoring Organizations (MO) and all entities that have a PEFC, FSC or equivalent CoC certificate that covers the biomass within the scope of the certificate can be considered as in compliance with Criteria 3.1. In the case that such certificates or DDS endorsed by MO do not exists, indicator 3.1.3 must be properly verified.

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Indicator 3.1.3 Legal source certificate or own DDS shall be implemented

Criterion 3.2. Guarantee product traceability to ensure compliance with EUTR.

This criterion is applicable only to Traders (as defined in EUTR regulation) of category 1 products. The EUTR establishes that Traders must be able to identify:

a. the operators or traders who have supplied the timber and timber products; and
b. Where applicable, the traders to whom they have supplied timber and timber products.

Traders shall keep the information referred to in paragraph 1 for at least five years and shall provide that information to competent authorities when requested to do so.

Indicator 3.2.1 A recognized PEFC, FSC or equivalent Chain of Custody certificate is in force

PEFC, FSC or equivalent Certification Schemes enable guarantees that the products included in the scope of the certificate are covered by traceability system that covers EUTR requirements. Thus, all entities that have a PEFC, FSC or equivalent CoC certificate covering the biomass within the scope of the certificate can be considered as in compliance with Criteria 3.2. In the case that such certificates do not exist indicator 3.2.2 must be properly verified.

Indicator 3.2.2 When no recognized PEFC, FSC or equivalent CoC certificate is endorsed, a register of purchases and sales, together with supplier and client names is kept for at least five years.

Criterion 3.3. Guarantee legal practices for woody biomass from urban or agricultural areas. Applicable to category 2 products.

Indicator 3.3.1 A harvest permit, an urban forest area maintenance permit or similar order issued for local authorities is in force. In case that the certified producer company is not the one harvesting, the permit is not obligatory but recommended.

Principle 4: Sustainable Management

Sustainable Forest Management (SFM) requirements are required for big producers. Big producers are the ones producing more than 30.000 tonnes based on previous year production. For the first year of certification the estimation will be valid. If the estimation are overpassed the sustainability requirements won't be required retroactively but they will be forced to fulfil for the next year

Criterion 4.1 Sustainable Forest Management (SFM)

The Pan-European Criteria and Indicators approved in the ministerial processes within the framework of FOREST EUROPE are adopted. The six Pan-European criteria for SFM that describe the different aspects of sustainable forest management in Europe are taken as main indicators of compliance.

Fulfilment of Pan-European SFM policies and criteria can be evaluated through a set of 45

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indicators (34 quantitative and 11 qualitative). A complete list of verifiers to guarantee the compliance of each of these Pan-European criteria is provided in Annex 1"Updated Pan-European Indicators SFM 2015"

- SFM Pan-European Criteria 1: Maintenance and appropriate enhancement of forest resources and their contribution to global carbon cycles.
- SFM Pan-European Criteria 2: Maintenance of forest ecosystems' health and vitality.
- SFM Pan-European Criteria 3: Maintenance and encouragement of productive functions of forests (wood and non-wood).
- SFM Pan-European Criteria 4: Maintenance, conservation and appropriate enhancement of biological diversity in forest ecosystems.
- SFM Pan-European Criteria 5: Maintenance, conservation and appropriate enhancement of protective functions in forest management (notably soil and water).
- SFM Pan-European Criteria 6: Maintenance of other socio-economic functions and conditions.

A valid PEFC or FSC FM certificate of the forest area shall be considered enough in order to demonstrate the compliance with SFM requirements.

Indicator 4.1.1 A recognized PEFC, FSC or equivalent Sustainable Forest Management (SFM) certificate is in force and the traceability of this origin is guaranteed through a valid Chain of Custody certificate. A system different from PEFC or FSC must be declared to the Biomasud Steering Committee through the National Licenser to verify its validity.

The company certified must account the raw materials acquired with guarantees that are coming from a certified SFM in the framework of its chain of custody certificate. The certified company shall establish the appropriate measures to increase annually the proportion of certified materials with respect to the total of its production. A minimum increase of 5% yearly is mandatory. The goal it's to achieve a 70%, when the certified company has a 70% of certified materials there is no need to increase any more this proportion.

Criterion 4.2 Soil Quality must be maintained or improved if possible.

Soil quality shall be maintained and where possible improved, for which, best practices are applied for the maintenance or improvement of soil and soil quality in relation to production or management objectives, as these have been included in a management plan. This Criterion applies to biomass categories C2 and C3 (in the case of C1 biomass category the requirement is included in the SFM Pan-European Criteria 5)

Indicator 4.2.1 A management plan is in force providing the guidelines to apply best practices for the maintenance or improvement of the soil and soil quality in relation to production or management objectives. In case that the certified producer company is not the one harvesting, the permit is not obligatory but recommended.

Principle 5: Carbon stock

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Criterion 5.1: Maintenance and Appropriate Enhancement of Forest Resources and their Contribution to Global Carbon Cycles.

Indicator 5.1.1: Forest management practices safeguard the quantity and quality of the forest resources in the medium and long term by balancing harvesting and growth rates, and by preferring techniques that minimise direct or indirect damage to forest, soil or water resources. Area and growing stock of forest and other wooded land, classified by forest type will be monitored periodically to ensure their maintenance and enhancement.
Holding a PEFC, FSC or equivalent SFM certificates meet the compliance of this indicator

Indicator 5.1.2: Appropriate silvicultural measures are taken to maintain or reach a level of the growing stock that is economically, ecologically and socially desirable. Carbon stock and carbon stock changes in forest biomass, forest soils and in harvested wood products will be monitored periodically to ensure their maintenance and enhancement.
Holding a PEFC, FSC or equivalent SFM certificates meet the compliance of this indicator

Criterion 5.2: Production of biomass does not destroy carbon sinks such as peatlands or wetlands

This criteria is only applicable to category 2 (Woody biomass from Urban or Agricultural areas) in an experimental basis. This means that the non-compliance with this criteria shall not prevent from the endorsement of BIOMASUD PLUS certificate.

Indicator 5.2.1: Land sourcing biomass was not classified as peatland on 1 January 2008, unless it can be demonstrated that the production and harvesting of the biomass does not result in water depletion of a formerly undrained soil.

Indicator 5.2.2: Land sourcing biomass was not classified as wetland on 1 January 2008, unless it can be demonstrated that the production and harvesting of the biomass does not result in water depletion of a formerly undrained soil.

Principle 6: Low Indirect Land Use Change (ILUC) risk

Criteria 6.1: Conversion of forests to other types of land use, including conversion of primary forests to forest plantations, shall not occur.

This criteria is only applicable to category 2 (Woody biomass from Urban or Agricultural areas) in an experimental basis. This means that the non-compliance with this criteria shall not prevent from the endorsement of BIOMASUD PLUS certificate.

Indicator 6.1.1: On average less than half the volume of the annual roundwood harvest from forests is processed as biomass for energy generation. This indicator is only applicable to category 1 (forest and other wooded lands).

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Criteria 6.2: Biomass sourced from new bioenergy plantation systems that were planted after 1 January 2008 must have a demonstrably low ILUC risk.

This criteria is only applicable to category 2 (Woody biomass from Urban or Agricultural areas) in an experimental basis. This means that the non-compliance with this criteria shall not prevent from the endorsement of BIOMASUD PLUS certificate.

Indicator 6.2.1: Low ILUC risks has been calculated using the LIIB methodology and requirements (LIIB = Low Indirect Impact Biofuels) or an equivalent method and a valid certificate is in force.

Indicator 6.2.2: A low ILUC risk monitoring plan is in force with a target timeline of at least 6 years. The plan must include the methodology to ensure (a) crop yield increases. The plan shall be evaluated every 2 years in order to assess if low ILUC risk objectives are met.

Criteria 6.3 The conversion of abandoned agricultural and treeless land into forest land is taken into consideration, whenever it can add economic, ecological, social and/or cultural value.

This criteria is only applicable in an experimental basis. This means that the non-compliance with this criteria shall not prevent from the endorsement of BIOMASUD PLUS certificate.

Indicator 6.3.1: A low ILUC risk monitoring plan is in force including the economic assessment of the addition of more than 3-year-non-used lands as a tool to increase carbon stocks

In the table below there is a list of all the Criteria and indicators and their applicability depending on the category of biomass.

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TABLE: APPLICABLE INDICATORS

			CATEGORIES			
			C1	C2	C3	C4
SUSTAINABILITY PRINCIPLES	**Criterion**	**INDICATORS**	Woody biomass from forest and other wooded land management	Woody biomass from Urban or Agricultural areas.	Non Wood agricultural residues.	Secondary and tertiary agro-forestry materials.
GHG Principle	**C1.1 Ensuring GHG reduction**	**I1.1.1:** The reduction of greenhouse gas emissions thanks to the use of certified biomass as a substitute for natural gas shall be a minimum of 70%. It takes into account the emissions produced when transporting the raw materials to the manufacturing facility and those generated in the process of preparing and conditioning the biofuel.	YES	YES	YES	YES
ENERGY DEMAND Principle	**C2.1 Reduced Energy Demand**	**I2.1.1** The energy used in transporting raw materials to the production facility and the energy used in the process of preparing and conditioning biofuel may not exceed 40% of the energy contained in the fuel (PCI on wet basis).	YES	YES	YES	YES
LEGAL LOGIN Principle	**C3.1. Implementation and maintenance of a Due Diligence System (DDS) to ensure compliance with EUTR.**	**I3.1.1** A recognized PEFC, FSC or equivalent certificate is in force. **I3.1.2** A Due Diligence system operated by a recognized monitoring organization is in force. **I3.1.3** Legal source certificate or own DDS that should be verified by BIOMASUD auditors.	YES	n/a	n/a	n/a
	C3.2. Guarantee product traceability to ensure compliance with EUTR.	**I3.2.1** A recognized PEFC, FSC or equivalent Chain of Custody certificate is in force **I3.2.2** A register of purchases and sales, together with supplier and client names is kept for at least five years.	YES	n/a	n/a	n/a
	C3.3. Guarantee legal practices for woody biomass from urban or agricultural areas.	**I3.3.1** A harvest permit, an urban forest area maintenance permit or similar order issued for local authorities is in force. Woody biomass management plan in agricultural areas.	n/a	YES	n/a	n/a

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TABLE: APPLICABLE INDICATORS

			CATEGORIES			
			C1	C2	C3	C4
SUSTAINABILITY PRINCIPLES	**Criterion**	**INDICATORS**	Woody biomass from forest and other wooded land management	Woody biomass from Urban or Agricultural areas.	Non Wood agricultural residues.	Secondary and tertiary agro-forestry materials.
SFM Principle	**C4.1 Sustainable Forest Management (SFM)**	I4.1.1 A recognized PEFC, FSC or equivalent Forest Management certificate is in force	YES (from 30.000 tonnes/year)	n/a	n/a	n/a
	C4.2 Soil Quality must be maintained or improved if possible	I4.2.1 A management plan is in force providing the guidelines to apply best practices for the maintenance or improvement of the soil and soil quality in relation to production or management objectives	YES (SFM) (from 30.000 tonnes/year)	Pilot Experiences	Pilot Experiences	n/a
CARBON STOCK Principle	**C5.1: Maintenance and Appropriate Enhancement of Forest Resources and their Contribution to Global Carbon Cycles.**	I5.1.1: Forest area. Area of forest and other wooded land, classified by forest type I5.1.2: Forest carbon. Carbon stock and carbon stock changes in forest biomass, forest soils and in harvested wood products.	YES (SFM) (from 30.000 tonnes/year)	n/a	n/a	n/a
	C5.2: Production of biomass does not destroy carbon sinks such as peatlands or wetlands	I5.2.1: Land sourcing biomass was not classified as peatland on 1 January 2008, unless it can be demonstrated that the production and harvesting of the biomass does not result in water depletion of a formerly undrained soil. I5.2.2: Land sourcing biomass was not classified as wetland on 1 January 2008, unless it can be demonstrated that the production and harvesting of the biomass does not result in water depletion of a formerly undrained soil	YES (SFM) (from 30.000 tonnes/year)	Pilot Experiences	n/a	n/a
LAND USE Principle	**C6.1: Conversion of forests to other types of land use, including conversion of primary forests to forest plantations, shall not occur.**	I6.1.1: On average less than half the volume of the annual roundwood harvest from forests is processed as biomass for energy generation. This indicator is only applicable to category 1.	YES (SFM) (from 30.000 tonnes/year)	Pilot Experiences	n/a	n/a

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TABLE: APPLICABLE INDICATORS

			CATEGORIES			
			C1	C2	C3	C4
SUSTAINABILITY PRINCIPLES	**Criterion**	**INDICATORS**	Woody biomass from forest and other wooded land management	Woody biomass from Urban or Agricultural areas.	Non Wood agricultural residues.	Secondary and tertiary agro-forestry materials.
	C6.2: Biomass sourced from new bioenergy plantation systems that were planted after 1 January 2008 must have a demonstrably low ILUC risk.	**I6.2.1:** Low ILUC risks has been calculated using the LIIB methodology and requirements (LIIB = Low Indirect Impact Biofuels) or an equivalent method and a valid certificate is in force. **I6.2.2:** A low ILUC risk monitoring plan is in force with a target timeline of at least 6 years. The plan shall be evaluated every 2 years in order to assess if low ILUC risk objectives are met.	YES (SFM) (from 30.000 tonnes/year)	Pilot Experiences	n/a	n/a
	C6.3 The conversion of abandoned agricultural and treeless land into forest land is taken into consideration, whenever it can add economic, ecological, social and/or cultural value.	**I6.3.1:** A low ILUC risk monitoring plan is in force with a target timeline of at least 6 years, including the economic assessment of the addition of more than 3-year-non-used lands as a tool to reduce carbon risk.	Pilot Experiences	Pilot Experiences	n/a	n/a

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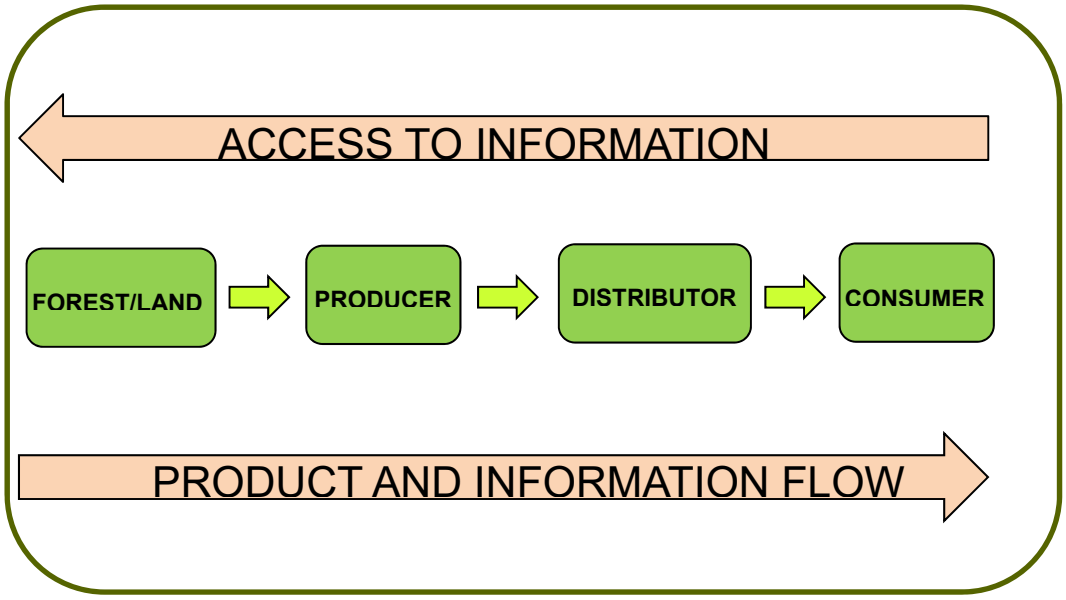
7 TRACEABILITY AND BIOMASUD ON-LINE PLATFORM

The Biomasud quality label is requiring quality (ash, moisture, etc.) and sustainability requirements (GHG, Energy, EUTR, SFM, CS, LUC) along the cycle of life of the biomass, but for warranting that the product bought by a consumer it is the same which has been produced with a minimum quality and sustainability. Platform has been set up in order to assure the traceability

This tracking system serves as self-control and quality assurance, through the identification number and register of the biomass products movements which have been documented in every step of the value chain, makes possible locate quality defects, offer to the consumer information about the quality and sustainability of the biomass products.



As cited in the chapter 4.9, producers must archive reference samples that in case of complaints can be analysed by a testing body and may compared with a sample taken at the complainant's if necessary.

7.1 IDENTIFICATION NUMBER

Through a system of unique identification numbers, each delivery should be able to be traced back the whole value chain from the end customer to the producer passing through the distributor(s) of the logistic chain.

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A code composed of the country 2 characters ISO CODE (ISO 3166-1-alpha-2 for example, ES for Spain)

And then an unique and correlative number for each country. The code is composed of three ciphers (001, 002, etc.) starting on 001 for Producers and starting on 300 for Traders

Also a code with 2-3 letters for each biomass will be added

- Wood pellets → WP
- Wood chips → WC
- Firewood → FW
- Olive stones → OT
- Pine nut shells → PNS
- Almond shells → AS
- Chopped pine cone → CP
- Hazelnut shells → HS
- Pistachio Shells → PCS
- Walnut Shells → WS
- Olive tree prunings → Wood chips OPW
  Pellets OPP
- Vineyard pruning → Wood chips → VPW
  Pellets → VPP

Unique ID. = Country Code + Correlative number + Biomass Code

i.e. ES 007 OT would be a Spanish producer of Olive Stones with the number 007.

It's obligatory to show the producer code or last certified trader inside the Biomasud logo (see example in chapter 11) on the bags, publicity or the invoices.

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If a manufacturer operates several production facilities the respective company can request for several numbers or can request the same number to use it commercially with all the plants. In this last case, internally they will have a different code for every plant. i.e. a producer with several plants has the code ES007. Internally for keeping traceability to auditors each plant will have a different code ES007-1, ES007-2 and successively

7.2 On line Platform and documentation

By means of the Biomasud Plus project an On line platform has been developed where the Label holders (Certified Producers and Traders) making possible to follow the biomass product along the supply chain. Producers and trader joining the quality label must introduce all the required data in order to keep the traceability. Also they must keep record of all the data (lots equivalences, producers/traders in / outs, etc.) and make available this documentation to auditors when required.

The platform can be accessed from the Biomasud Web page (http://biomasud.eu/) or through a direct access http://trazabilidad.grupotercerafase.com/. Producers and Traders will have to log in for being able to introduce their data. An User and a Password will be provided by the National Licenser to access the platform. The inspector body will have access to these data.

In the platform, basic contact data of the company and its quality manager will be included.

The Certified Producer or Trader will include information of Every Lot

- Number of Lot
- Type of Biofuel produced
- Quality of the solid Biofuel produced (A1, B…)
- Quantity producer
- CO2 emissions (automatically calculated by the platform after entering required data)

A QR code is produced that can be downloaded an used on bags, invoices or webs but it's not obligatory its use.

The data stored in this data base can be used by the National Licensers and the Biomasud Steering Committee for statistics and promotion uses. No individual data will be published without an explicit authorisation

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8 QUALITY MANAGEMENT

In order to fulfil a minimum quality, a basic quality management system must be set up in the label holder installations. In this chapter, the guidelines for internal quality management are established. How these guidelines are implemented is largely left up to the certificate holders. EN 15234-6 requirements will be the basis of the Biomasud quality system. Alternatively, a quality management system according to ISO 9001 can be set up.

8.1 PRODUCTION

8.1.1 TECHNICAL OPERATING EQUIPMENT AND OPERATION PROCESSES

The production facilities must fulfil the following requirements:

- The certificate holder must have adequate technical equipment for the production, loading and possible packaging of biomasses at its disposal. The functions and condition of this equipment must be regularly checked.
- When raw materials are received from new suppliers, their adequacy has to be checked (incoming goods inspection), e.g., through certification of the manufacturer or by an individual inspection (i.e. checking the ash, moisture, chlorine and nitrogen content, the ash melting behaviour).
- Contaminations of the raw materials by substances such as soil, stones and grain, as well as contaminations of the manufactured biomasses, must also be excluded. Manipulation areas, silos and conveyor equipment must be regularly checked for soiling and, if necessary, cleaned. This also applies to each loading of external vehicles, as far as it does not involve special vehicles for the exclusive biomass transport.
- Fines are an important quality requirement in wood pellets. Producers have to sieve wood pellets before loading the trucks or being bagged to fulfil maximum threshold established by Biomasud quality label (see annex 1 for limits).
- Apart from the treatments for drying the biomasses if necessary, they must be stored under cover in an appropriate storage to not absorb any water, i.e. through contact with condensed water, rain or snow.
- In the case of malfunctions in the production process, it must be checked which quantities of defective biomasses were produced up until the malfunction was

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noticed. These biomass products are not allowed to be sold under the Biomasud quality label.

- After repair and maintenance work has been completed, the manufactured biomasses must undergo an in-house quality inspection.
- All involved employees must receive training from the quality assurance representative concerning the required quality demands.
- The label holder must have the appropriate testing instruments and testing means, as well as the commensurate knowledge to inspect the manufactured biofuels.

8.1.2 Reporting of Produced Quantities

Every lot traded must be reported in the On Line platform (see 7.2) with the quantities of the different biomasses traded with the Biomasud label.

8.1.3 Quality Assurance Representative

Label holder management must appoint an experienced employee as a quality assurance representative. This person must ensure the orderly internal documentation and is responsible for archiving reference samples, as well as carrying out self-inspections, if necessary. The appointed employee must know the effects of different operating processes on the quality of the manufactured biomasses and appropriately train the other employees for their areas. Moreover, he/she is the contact partner for his/her colleagues in the case of malfunctions in the production process. The quality assurance representative can delegate individual monitoring and documentation tasks to other employees. In this case, he/she has to brief the responsible employee and monitor the orderly execution of these tasks. Additionally, the quality assurance representative has to participate in an external training course for quality assurance in the first year of certification.

8.1.4 Internal Documentation

The quality assurance representative must ensure the orderly documentation and evaluation of operating processes that have an effect on the quality of the manufactured biomasses. In detail, the documentation must comprehend the following points:

- Raw materials and additives receiving (date, quantity and name of the supplier; for pressing aids: the type of material, internal storage location identity)

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- Outgoing goods (date, quality category, quantity and name of the customer), the used vehicles or external forwarders, and the freight which was last transported by the vehicle – in as much as no special vehicle will be used for the exclusive transportation of the pellets - as well as a description of the respective reference samples
- The addition of pressing aids or other additives (type: data sheet with the chemical composition, as well as dosage)
- Manufacturing of biomasses under the label or not (period, quality, quantity)
- Production process malfunctions (date, type of malfunction, measures taken to solve the problem, quantity and disposition of the biomasses which cannot be sold under the label)
- More extensive repair and maintenance work that could lead to a change in the biomass quality (date, type of work performed)
- Employee training regarding the effect of the various production factors on the biomass quality (date, participants, contents)
- Areas of responsibility of the individual employees
- Self-inspection (documentation and evaluation of the results)
- Customer complaints (date, results of the findings, measures taken to remedy the defects, if necessary).

The documentation is always to be kept up-to-date and regularly presented to management for its verification. For this purpose, it is recommended to maintain a shift book. Discovered defects are to be immediately disclosed to the responsible employees and to be remedied.

8.1.5 Self-Inspections

The producer must regularly inspect the quality of the manufactured biomasses to verify the fulfilment of the product requirements and to avoid the production of larger defective batches. When reasonable doubts concerning the biomass quality exist, the accredited testing centre can stipulate more frequent internal inspections in the scope of monitoring or extraordinary inspections.

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Frequency of the checks will be stated by the producer proportionally to its production size and its batch definition[3]. A big producer[4] should make a self-inspection per shift (it's batch definition would be of a shift). Smaller producers should be inspected at least once per batch. It's recommended to calculate the frequency of the checks with the following formula (EN 15234-6):

$$N = \frac{10}{days} * \sqrt{\frac{ton}{10}}$$

N	number of sample in 24h
days	annual working days
ton	annual quantity of biomass in tons

Example N=10/220*√50 000/10 = 3 times per 24h

Parameters that must be inspected in the scope of internal quality inspections are listed below.

Parameter	**Point of the Test**	**Frequency**
Bulk density (BD) (except for firewood)	After production, before storage	At least once per batch
Moisture (M)	After production, before storage	At least once per batch
Mechanical durability (DU) (biomasses in form of pellets)	After production, before storage	At least once per batch
Particle size (biomasses in form of chips)	After production, before storage	At least one per batch
Fines (F) (except for firewood)	At the last possible point before delivery	At least once per batch
Length (L) (only for biomasses in form of pellets)	After production before storage	At least once per batch o when visual inspections indicate long pellets
Diameter (D) (only for firewood)	After production before storage	At least once per batch

[3] Every biomass production facility must define its batch size in its internal quality system which is the final product quantity manufactured in the same conditions (same raw material, machine configuration, etc.)

4 Producers with a >30.000 tons / year are considered big producers

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Internal controls should be performed according to methods approved by the inspection body. There is no need to follow strictly the laboratory standard but using a method that ensures an adequate accuracy for the purpose of internal controls.

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9 RAW MATERIAL REQUIREMENTS

The types of raw material or sources for biomasses indicated in Annex 1 that are acceptable for the Biomasud quality label are obtained from ISO 17225-1 standard. In the next table are defined the sources permitted for every domestic biomass fuel under the quality label.

9.1 RAW MATERIALS AND SOURCES PERMITTED

Table 1: Raw material and sources permitted for Biomasud quality label biomasses as per the ISO-17225-1

	Biomass quality class			
Biomass type	**A / A1 /P1 /PI1**	**A2 / P2 / PI2**	**B / B1 /P3/ PI3**	**B2**
Wood pellets	1.1.3 Stemwood 1.2.1 Chemically untreated wood by-products and residues	1.1.1 Whole trees without roots 1.1.3 Stemwood 1.1.4 Logging residues 1.1.6 Bark (from forestry operations) 1.2.1 Chemically untreated wood by-products and residues	1.1 Forest, plantation and other virgin wood 1.2 By-products and residues from wood processing industry 1.3 Used wood	-
Wood chips	1.1.1 Whole trees without roots[a] 1.1.3 Stemwood 1.2.1 Chemically untreated wood by-products and residues 1.1.4. Logging residues	1.1.1 Whole trees without roots[a] 1.1.3 Stemwood 1.2.1 Chemically untreated wood by-products and residues 1.1.4.3 Logging residues	1.1 Forest, plantation and other virgin wood[b] 1.2.1 Chemically untreated wood by-products and residues	1.2 By-products and residues from wood processing industry 1.3 Used Wood
Firewood	1.1.3 Stemwood 1.2.1 Chemically untreated wood by-products and residues	1.1.1 Whole trees without roots[a] 1.1.3 Stemwood 1.2.1 Chemically untreated wood by-products and residues	1.1.1 Whole trees without roots[a] 1.1.3 Stemwood 1.1.4. Logging residues 1.2.1 Chemically untreated wood by-products and residues	
Olive tree prunnings	1.1.7 Segregated wood from gardens, parks, roadside maintenance, vineyards, fruit orchards and	1.1.7 Segregated wood from gardens, parks, roadside maintenance, vineyards, fruit orchards and driftwood from freshwater	1.1.7 Segregated wood from gardens, parks, roadside maintenance, vineyards, fruit orchards and driftwood from freshwater	1.1.7 Segregated wood from gardens, parks, roadside maintenance, vineyards, fruit orchards and

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	driftwood from freshwater			driftwood from freshwater
Vineyard prunings	1.1.7 Segregated wood from gardens, parks, roadside maintenance, vineyards, fruit orchards and driftwood from freshwater	1.1.7 Segregated wood from gardens, parks, roadside maintenance, vineyards, fruit orchards and driftwood from freshwater	1.1.7 Segregated wood from gardens, parks, roadside maintenance, vineyards, fruit orchards and driftwood from freshwater	1.1.7 Segregated wood from gardens, parks, roadside maintenance, vineyards, fruit orchards and driftwood from freshwater
Olive stones	3.1.2.3 Stone/kernel fruits 3.1.1.2 Stone/kernel fruit fibre 3.2.2.2 Stone/kernel fruits (chemically treated)[c]	3.1.2.3 Stone/kernel fruit fibre 3.1.1.2 Stone/kernel fruit fibre 3.2.2.2 Stone/kernel fruits (chemically treated)[c]	3.1.2.3 Stone/kernel fruit fibre 3.1.1.2 Stone/kernel fruit fibre3.2.2.2 Stone/kernel fruits (chemically treated)[c]	-
Almond shells	3.1.3.2 Shells/husks	3.1.3.2 Shells/husks	3.1.3.2 Shells/husks	-
Chopped pine cone	3.1.3.2 Shells/husks	3.1.3.2 Shells/husks	3.1.3.2 Shells/husks	-
Pine nut shells	3.1.3.2 Shells/husks	3.1.3.2 Shells/husks	3.1.3.2 Shells/husks	
Hazelnut shells	3.1.3.2 Shells/husks	3.1.3.2 Shells/husks	3.1.3.2 Shells/husks	
Pistachio Shells	3.1.3.2 Shells/husks	3.1.3.2 Shells/husks	3.1.3.2 Shells/husks	

[a] Excluding class 1.1.1.3 Short rotation coppice, if reason to suspect contamination of land or if planting has been used for the sequestration of chemicals or wood is fertilized by sewage sludge (issued from waste water treatment or chemical process.

[b] Excluding classes 1.1.5 Stumps/roots and 1.1.6 Bark.

[c] The olive stones can come from oil mills or from oil extracting industries. If they come from oil extracting industries they may have undergone chemical treatment with hexane or other solvents to extract the residual oil (this solvent is recovered later). This extraction process and the solvent must be declared. Olive stones treated with chemical additives such as salt or soda are excluded from this standard.

If composition of mixture is known, the w-% can be used to specifying blends.

Example 1: 80 w-% 1.1.1 Whole trees without roots, 20 w-% 1.2.1 chemically untreated wood residues

In the case of mixture, the main component should be stated first.

9.2 Requirements for additives

Additives (i.e. pressing aids or slagging inhibitors) are used to improve fuel quality, to decrease emissions or to boost burning efficiency are allowed. The type (material and trade name) and quantity (in max.-%) of the pressing additives used have to be documented.

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Also additives, which are used after production, before delivery to end-user storages, must be documented. Water, heat and steam are not additives in terms of this regulation.

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10 LOGO AND EXAMPLES OF THE PRODUCT DECLARATION

Firstly, the seal has to feature a minimum height of 15 mm. The identification number of the label holder is an essential component for traceability purposes and must be displayed close to the seal. Furthermore, the height of the identification number may not be any smaller than ten percent of the seal's height, but a minimum height of 1.5 mm (Arial font size of 10).

The logo must be displayed in one of the colour variations or in monochrome specified here.

There are two different design of label's logo depending on the kind of solid biofuels.

The logo for domestic solid biofuels for small installations (<400 kW) is:

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The logo for domestic solid biofuels for big installations (>400 kW) is:

In both logos:

- Where it says “Certified Biomass” it shall be mentioned the solid biofuel certified (olive stone, …) in the language of the country where is going to be mainly distributed.
- Where it says “A” or “B” it shall be stated the quality class of the solid biofuel
- Where it says “XX” it shall be stated the code of the country
- Where it says “00X” it shall be stated the Id. number of the company certified
- Where it says “BB” it shall be stated the code of the Biomass (i.e. OT for Olive Stones)

The quality label seal has to be used only in addition with the identification number of the certificate holder.

Using the seal without the identification number is not possible but with written authorization of the Biomasud Steering committee.

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ANNEX 1: SPECIFICATIONS OF DOMESTIC BIOMASSES FOR SMALL INSTALLATIONS (<400 KW)

1. **Wood pellets**. Limits according to ISO 17225-2 (table 1)

	Property class /Analysis method	**Unit**	**A1**	**A2**
Normative	Origin and source ISO 17225-1		1.1.3 Stemwood 1.2.1 Chemically untreated wood residues	1.1.1 Whole trees without roots 1.1.3 Stemwood 1.1.4 Logging residues 1.1.6 Bark 1.2.1 Chemically untreated wood residues
	Diameter, D [a] and Length L, [b], ISO 17829	mm	D06, 6 ± 1; 3,15 ≤ L ≤ 40 D08, 8 ± 1 3,15 ≤ L ≤ 40	D06, 6 ± 1; 3,15 ≤ L ≤ 40 D08, 8 ± 1; 3,15 ≤ L ≤ 40
	Moisture, M, ISO 18134-1, ISO 18134-2	as received, w-% wet basis	M10 ≤ 10	M10 ≤ 10
	Ash, A, ISO 18122	w-% dry	A0.7 ≤ 0,7	A1.2 ≤ 1,2
	Mechanical durability, DU, ISO 17831-1	as received, w-%	DU97.5 ≥ 97,5	DU97.5 ≥ 97,5
	Fines F, ISO 18846	w-% as received	F1.0 ≤ 1,0	F1.0 ≤ 1,0
	Additives [c]	w-% dry	≤ 2 w-% Type and amount to be stated	≤ 2 w-% Type and amount to be stated
	Net calorific value, Q, ISO 18125	as received, MJ/kg or kWh/kg	Q16.5 16,5 ≤ Q ≤ 19 or Q4.6 4,6 ≤ Q ≤ 5,3	Q16.3 16,3 ≤ Q ≤ 19 or Q4.5 4,5 ≤ Q ≤ 5,3
	Bulk density, BD, ISO 17828	kg/m^3	BD600 ≥ 600	BD600 ≥ 600
	Nitrogen, N, ISO 16948	w-% dry	N0.3 ≤ 0,3	N0.5 ≤ 0,5
	Sulphur , S, ISO 16994	w-% dry	S0.04 ≤ 0,04	S0.05 ≤ 0,05
	Chlorine, Cl, ISO 16994	w-% dry	Cl0.02 ≤ 0,02	Cl0.02 ≤ 0,02
	Arsenic, As, ISO 16968	mg/kg dry	≤ 1	≤ 1
	Cadmium, Cd, ISO 16968	mg/kg dry	≤ 0,5	≤ 0,5
	Chromium, Cr, ISO 16968	mg/kg dry	≤ 10	≤ 10
	Copper, Cu, ISO 16968	mg/kg dry	≤ 10	≤ 10
	Lead, Pb, ISO 16968	mg/kg dry	≤ 10	≤ 10
	Mercury, Hg, ISO 16968	mg/kg dry	≤ 0,1	≤ 0,1
	Nickel, Ni, ISO 16968	mg/kg dry	≤ 10	≤ 10
	Zinc, Zn, ISO 16968	mg/kg dry	≤ 100	≤ 100
	Informative: Ash melting behavior [d], prEN15370	°C	Should be stated	Should be stated

[a] Actual diameter class (D06, D08) of pellets to be stated.
[b] Amount of pellets longer than 40 mm can be 1 w-%. Maximum length shall be < 45 mm.
[c] Type of additives to aid production, delivery or combustion (e.g., pressing aids, slagging inhibitors or any other additives like starch, corn flour, potato flour, vegetable oil,…). Also additives which are used after production, before unloading to end-user storages, shall be stated similarly (type and amount).
[d] All characteristic temperatures (shrinkage starting temperature (SST), deformation temperature (DT), hemisphere temperature (HT) and flow temperature (FT) in oxidizing conditions should be stated.

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2. **Wood chips**.

Particle size thresholds according to ISO 17225-4 (table 2.1)

Dimensions (mm). ISO 17827-1					
Main fraction [a] (minimum 60 w-%). mm		**Fines fraction, w-% (< 3,15 mm)**	**Coarse fraction, w-%, (length of particle mm)**	**Max. length of particles [b], mm**	**Max. cross section area of the coarse fraction [c], cm^2**
P16S	3,15 mm < P ≤ 16 mm.	≤ 15 %	≤ 6% (> 31,5 mm)	≤ 45 mm	≤ 2 cm^2
P31S	3,15 ≤ P ≤ 31,5 mm	≤ 10%	≤ 6% (> 45 mm)	≤ 150 mm	≤ 4 cm^2
P45S	3,15 ≤ P ≤ 45 mm	≤ 10%	≤ 10% (> 63 mm)	≤ 200 mm	≤ 6 cm^2

[a] The numerical values (P-class) for dimension refer to the particle sizes passing through the mentioned round hole sieve size (ISO-17827-1). The lowest possible class should be stated. Only one class shall be specified for wood chips.

[b] Length and cross sectional area only have to be determined for those particles, which are to be found in the coarse fraction. Maximum 2 pieces of about 10 litre sample may exceed the maximum length, if the cross sectional area is < 0,5 cm^2

c For measuring the cross sectional area it is recommended to use a transparent set square, place the particle orthogonally behind the set square and estimate the maximum cross sectional area of this particle of the cm^2 pattern.

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Limits according to ISO 17225-4 (table 2.2)

	Property class /Analysis method	**Unit**	**A1**	**A2**
Normative	Origin and source ISO 17225-1		1.1.1 Whole trees without roots[a] 1.1.3 Stemwood 1.2.1 Chemically untreated wood residues 1.1.4.3 Logging residues	1.1.1 Whole trees without roots[a] 1.1.3 Stemwood 1.2.1 Chemically untreated wood residues 1.1.4.3 Logging residues
	Particle size, P ISO 17827-1	mm	to be selected from table 1	
	Moisture, M[b], ISO 17827-1 ISO 18134-2	as received, w-% wet basis	M10 ≤ 10 M25 ≤ 25	M35 ≤ 35
	Ash, A, ISO 18112	w-% dry	A1.0 ≤ 1,0	A1.5 ≤ 1,5
	Bulk density, BD [c], ISO 17828	kg/loose m^3 as received	BD150 ≥ 150 BD200 ≥ 200 BD250 ≥ 250	BD150 ≥ 150 BD200 ≥ 200 BD250 ≥ 250 BD300 ≥ 300
	Nitrogen, N, ISO 16948	w-% dry	Not applicable	Not applicable
	Sulphur , S, ISO 16994	w-% dry	Not applicable	Not applicable
	Chlorine, Cl, ISO 16994	w-% dry	Not applicable	Not applicable
	Arsenic, As, ISO 16968	mg/kg dry	Not applicable	Not applicable
	Cadmium, Cd, ISO 16968	mg/kg dry	Not applicable	Not applicable
	Chromium, Cr, ISO 16968	mg/kg dry	Not applicable	Not applicable
	Copper, Cu, ISO 16968	mg/kg dry	Not applicable	Not applicable
	Lead, Pb, ISO 16968	mg/kg dry	Not applicable	Not applicable
	Mercury, Hg, ISO 16968	mg/kg dry	Not applicable	Not applicable
	Nickel, Ni, ISO 16968	mg/kg dry	Not applicable	Not applicable
	Zinc, Zn, ISO 16968	mg/kg dry	Not applicable	Not applicable
	Ne t calorific value, Q, ISO 18125	MJ/kg or kWh/kg as received	Minimum value to be stated	

[a] Excluding class 1.1.1.3 Short rotation coppice, if reason to suspect contamination of land or if planting has been used for the sequestration of chemicals or wood is fertilized by sewage sludge (issued from waste water treatment or chemical process).

[b] Lowest possible property class to be stated. Certain boilers require minimum moisture content, which should to be stated. Moisture class M10 is for artificially dried wood chips

[c] The bulk density is lower for coniferous than for broad leaf wood

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3. **Firewood**.

Limits according to ISO 17225-5 (table 3)

	Property class /Analysis method	**Unit**	**A1**	**A2**
Normative	Origin and source ISO 17225-1		1.1.3 Stemwood 1.2.1 Chemically untreated wood residues	1.1.1 Whole trees without roots 1.1.3 Stemwood 1.1.4 Logging residues 1.2.1 Chemically untreated wood residues
	Wood species[a]		to be stated	
	Diameter, D[b]	cm	D2 ≤2 D5 2 < D ≤ 5 D15 5 < D ≤ 15 D15+ > 15 (actual value to be stated)	D15 5 < D ≤ 15 D15+ >15 (actual value to be stated)
	Length, L[c]	cm	L20 ≤ 20 (± 2 cm) L25 ≤ 25 (± 2 cm) L30 ≤ 30 (± 2 cm) L33 ≤ 33 (± 2 cm) L40 ≤ 40 (± 2 cm) L50 ≤ 50 (± 4 cm) L100 ≤ 100 (± 5 cm)	L30 ≤ 30 (± 2 cm) L33 ≤ 33 (± 2 cm) L40 ≤ 40 (± 2 cm) L50 ≤ 50 (± 4 cm) L100 ≤ 100 (± 5 cm)
	Moisture, M[d], ISO 18134-1 ISO 18134-2	as received, w-% wet basis	M20 ≤ 20 M25 ≤ 25	M20 ≤ 20 M25 ≤ 25 M35 ≤ 35
	Volume or weight	Volume m^3 stacked or loose or weight, kg as received	To be stated which unit is used when retailed (m^3 stacked or loose, kg) and/or packaged log wood weight	
informative	Energy density, E[e] Or Net calorific value, Q [e], ISO 18125	MJ/kg or kWh/m^3 stacked or loose MJ/kg or kWh/kg as received	Recommended to be stated	
	Drying		Recommended to be stated, if firewood is dried by natural seasoning by ambient air or artificially by hot air	
	Moisture, U[d]	w-% dry basis	U25 ≤ 25 U33 ≤ 33	
	Decay and mould	% of pieces	No visible decay	≤ 5
	Proportion of split volume	% of pieces		
	The cut-off surface		Even and smooth[f]	No requirements

[a] Wood species (e.g. spruce, birch, beech) can be stated by using EN 13556 Round and sawn timber Nomenclature. If firewood include different wood species, the main wood species should be mentioned first.

[b] 85% of the firewood should be kept in specified diameter property class. For stoves it is recommended to use firewood with a diameter less than 15 cm. D2 and D5 are recommended for cookers and as a kindling (ignition wood). In informative Annex B from ISO 17225-5 a simple method for measuring of the diameter is specified.

[c] It is allowed to have 15% firewood shorter than requested length including the limit value.

[d] Moisture content should not be less 12 w-% on wet basis (M) or 13,64 w-% on dry basis (U).

[e] The energy density (E) may be calculated according to Annex C from ISO 17225-5 on the basis of the bulk density (BD) and the net calorific value.

[f] Use of chainsaw and circular saw will give a smooth and event cut-off surface

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4. **Olive Stones**. Limits based on UNE 164003 and updated with deliverable D3.3 of BIOMASUD PLUS project. (table 4)

	Property class /Analysis method		**Unit**	**A1**	**A2**
Normative	Origin and source ISO 17225-1			3.1.2.3 Stone/kernel/ fruit fibre 3.2.1.2 Stone/kernel/ fruit fibre 3.2.2.2 Chemically treated Stone/ kernel fruits[a]	3.1.2.3 Stone/kernel/ fruit fibre 3.2.1.2 Stone/kernel/ fruit fibre 3.2.2.2 Chemically treated Stone/ kernel fruits
	Particle size[b] EN 15149-1 ISO 17827-1	Fines, F < 2 mm	as received, w-% wet basis	< 15	< 15
	Oil content, ISO 659		w-% dry	≤ 0,6	≤ 1,0
	Moisture, M, EN 14774-1, EN 14774-2 ISO 18134-1; ISO 18134-2		as received, w-% wet basis	M12 ≤ 12	M12 ≤ 12
	Ash, A, EN14775; ISO 18122		w-% dry	A0.7≤ 0,7	A1.0 ≤ 1,0
	Net calorific value, Q, EN 14918; ISO 18125		as received, MJ/kg or kWh/kg	Q15.7 Q ≥ 15,7 or Q ≥ 4,4	Q15.7 Q ≥ 15,7 or Q ≥ 4,4
	Bulk density, BD, EN 15103; ISO 17828		kg/m^3	BD700 ≥ 700	BD650 ≥ 650
	Nitrogen, N, EN 15104; ISO 16948		w-% dry	N0.3 ≤ 0,3	N0.4 ≤ 0,4
	Sulphur , S, EN 15289; ISO 16994		w-% dry	S0.03 ≤ 0,03	S0.04 ≤ 0,04
	Chlorine, Cl, EN 15289; ISO 16968		w-% dry	Cl0.03 ≤ 0,03	Cl0.04 ≤ 0,04
	Arsenic, As, EN 15297; ISO 16968		mg/kg dry	≤ 0,5	≤ 0,5
	Cadmium, Cd, EN 15297; ISO 16968		mg/kg dry	≤ 0,5	≤ 0,5
	Chromium, Cr, EN 15297; ISO 16968		mg/kg dry	≤ 10	≤ 10
	Copper, Cu, EN 15297; ISO 16968		mg/kg dry	≤ 15	≤ 15
	Lead, Pb, EN 15297; ISO 16968		mg/kg dry	≤ 10	≤ 10
	Mercury, Hg, EN 15297; ISO 16968		mg/kg dry	≤ 0,01	≤ 0,01
	Nickel, Ni, EN 15297; ISO 16968		mg/kg dry	≤ 15	≤ 15
	Zinc, Zn, EN 15297; ISO 16968		mg/kg dry	≤ 100	≤ 2100

[a] Olive stones can come from olive mills or oil extractor industries. If they come from oil extractor industries may have suffer a chemical treatment with hexane or other solvents for extracting the residual oil (this solvent is recovered later on). This extraction process and the solvent have to be declared. Olive stones treated with chemical additives such as salt or soda are excluded from this standard.

[b] 100% of the mass must pass through a 16 mm sieve

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5. **Almond / Hazelnut Shells**. Limits based on UNE 164004 and updated with deliverable D3.3 of BIOMASUD PLUS project. (table 5)

	Property class /Analysis method		**Unit**	**A1** [a]	**A2**
Normative	Origin and source ISO 17225-1			3.1.3.2Shells/husks	3.1.3.2 Shells/husks
	Particle size[b] EN 15149-1 ISO 17827-1	Fines, F <2 mm	**as received, w-% wet basis**	< 2	< 2
	Oil content, ISO 659		w-% dry	≤ 0,6	≤ 1,0
	Moisture, M, EN 14774-1, EN 14774-2 ISO 18134-1; ISO 18134-2		as received, w-% wet basis	M12 ≤ 12	M12 ≤ 12
	Ash, A, EN14775		w-% dry	A0.7≤ 0,7	A1.5≤ 1,5
	Net calorific value, Q, EN 14918; ISO 18125		as received, MJ/kg or kWh/kg	Q15.0 Q ≥ 15,0 or Q ≥ 4,2	Q15.0 Q ≥ 15,0 or Q ≥ 4,2
	Bulk density, BD, EN 15103 ISO 17828		kg/m^3	Almond shells BD450 ≥ 500 Hazelnut shells BD300 ≥ 300	BD300 ≥ 300
	Nitrogen, N, EN 15104 ISO 16948		w-% dry	N0.4 ≤ 0,4	N0.6 ≤ 0,6
	Sulphur , S, EN 15289 ISO 16994		w-% dry	S0.03 ≤ 0,03	S0.03 ≤ 0,03
	Chlorine, Cl, EN 15289 ISO 16994		w-% dry	Cl0.02 ≤ 0,02	Cl0.03 ≤ 0,03
	Arsenic, As, EN 15297 ISO 16968		mg/kg dry	≤ 0,5	≤ 0,5
	Cadmium, Cd, EN 15297 ISO 16968		mg/kg dry	≤ 2	≤ 2
	Chromium, Cr, EN 15297 ISO 16968		mg/kg dry	≤ 10	< 10
	Copper, Cu, EN 15297 ISO 16968		mg/kg dry	≤ 15	≤ 15
	Lead, Pb, EN 15297 ISO 16968		mg/kg dry	≤ 15	≤ 15
	Mercury, Hg, EN 15297 ISO 16968		mg/kg dry	≤ 0,01	≤ 0,01
	Nickel, Ni, EN 15297 ISO 16968		mg/kg dry	≤ 15	≤ 15
	Zinc, Zn, EN 15297 ISO 16968		mg/kg dry	≤ 20	≤ 20

[a] Class A1 is specific for grounded and sieved shells
[b] 100% of the mass must pass through a 31,5 mm sieve

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6. **Chopped pine cone**. Limits according to 164004 (table 6)

	Property class /Analysis method		**Unit**	**A1** [a]	**A2**
Normative	Origin and source ISO 17225-1			3.1.3.2 Shells/husks	3.1.3.2 Shells/husks
	Particle size[b] EN 15149-1 ISO 17827-1	Fines, F <1 mm	**as received, w-% wet basis**	≤ 1	≤ 1
		Fines, F <2 mm	**as received, w-% wet basis**	≤ 2	≤ 2
		Maximum nominal size	**mm**	≤ 31,5	≤ 31,5
	Moisture, M, EN 14774-1, EN 14774-2 ISO 18134-1; ISO 18134-2		as received, w-% wet basis	M12 ≤ 12	M12 ≤ 12
	Ash, A, EN14775 ISO 18122		w-% dry	A0.8≤ 0,8	A1.1≤ 1,1
	Net calorific value, Q, EN 14918; ISO 18125		as received, MJ/kg or kWh/kg	Q15.8 Q ≥ 15,8 or Q ≥ 4,4	Q15.8 Q ≥ 15,8 or Q ≥ 4,4
	Bulk density, BD, EN 15103 ISO 17828		kg/m^3	BD400 ≥ 400	BD350 ≥ 350
	Nitrogen, N, EN 15104 ISO 16948		w-% dry	N0.3 ≤ 0,3	N0.4 ≤ 0,4
	Sulphur , S, EN 15289 ISO 16994		w-% dry	S0.03 ≤ 0,03	S0.03 ≤ 0,03
	Chlorine, Cl, EN 15289 ISO 16994		w-% dry	Cl0.05 ≤ 0,05	Cl0.07 ≤ 0,07
	Arsenic, As, EN 15297 ISO 16968		mg/kg dry	≤ 0,5	≤ 0,5
	Cadmium, Cd, EN 15297 ISO 16968		mg/kg dry	≤ 2	≤ 2
	Chromium, Cr, EN 15297 ISO 16968		mg/kg dry	≤ 10	< 10
	Copper, Cu, EN 15297 ISO 16968		mg/kg dry	≤ 15	≤ 15
	Lead, Pb, EN 15297 ISO 16968		mg/kg dry	≤ 10	≤ 10
	Mercury, Hg, EN 15297 ISO 16968		mg/kg dry	≤ 0,01	≤ 0,01
	Nickel, Ni, EN 15297 ISO 16968		mg/kg dry	≤ 10	≤ 10
	Zinc, Zn, EN 15297 ISO 16968		mg/kg dry	≤ 20	≤ 20

[a] Class A1 is specific for grounded and sieved shells
[b] 100% of the mass must pass through a 45 mm sieve in classes A1 and A2 and through a 63 mm sieve in class B

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

7. **Pine nut shells**. Limits based on UNE 164004 and updated with deliverable D3.3 of BIOMASUD PLUS project. (table 7)

	Property class /Analysis method		**Unit**	**A1** [a]	**A2**
Normative	Origin and source ISO 17225-1			3.1.3.2 Shells/husks	3.1.3.2 Shells/husks
	Particle size[b] EN 15149-1 ISO 17827-1	Fines, F <2 mm	as received, w-% wet basis	< 2	< 2
	Oil content, ISO 659		w-% dry	≤ 0,6	≤ 1,0
	Moisture, M, EN 14774-1, EN 14774-2 ISO 18134-1; ISO 18134-2		as received, w-% wet basis	M12 ≤ 12	M12 ≤ 12
	Ash, A, EN14775 ; ISO 18122		w-% dry	A0,7≤ 1,3	A1.5≤ 1,5
	Net calorific value, Q, EN 14918 ; ISO 18125		as received, MJ/kg or kWh/kg	Q16.0 Q ≥ 16,0 or Q ≥ 4,4	Q16.0 Q ≥ 16,0 or Q ≥ 4,4
	Bulk density, BD, EN 15103 ISO 17828		kg/m^3	BD470 ≥ 470	BD470 ≥ 470
	Nitrogen, N, EN 15104 ISO 16948		w-% dry	N0.4 ≤ 0,4	N0.6 ≤ 0,6
	Sulphur , S, EN 15289 ISO 16994		w-% dry	S0.03 ≤ 0,03	S0.03 ≤ 0,03
	Chlorine, Cl, EN 15289 ISO 16994		w-% dry	Cl0.02 ≤ 0,02	Cl0.03 ≤ 0,03
	Arsenic, As, EN 15297 ISO 16968		mg/kg dry	≤ 0,5	≤ 0,5
	Cadmium, Cd, EN 15297 ISO 16968		mg/kg dry	≤ 1	≤ 1
	Chromium, Cr, EN 15297 ISO 16968		mg/kg dry	≤ 15	< 15
	Copper, Cu, EN 15297 ISO 16968		mg/kg dry	≤ 20	≤ 20
	Lead, Pb, EN 15297 ISO 16968		mg/kg dry	≤ 15	≤ 15
	Mercury, Hg, EN 15297 ISO 16968		mg/kg dry	≤ 0,01	≤ 0,01
	Nickel, Ni, EN 15297 ISO 16968		mg/kg dry	≤ 15	≤ 15
	Zinc, Zn, EN 15297 ISO 16968		mg/kg dry	≤ 100	≤ 100

[a] Class A1 is specific for grounded and sieved shells
[b] 100% of the mass must pass through a 31,5 mm sieve

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

8. **Pistachio shells**. Quality specifications according deliverable D.3.3. of BIOMASUD PLUS project (table 8)

	Property class /Analysis method		**Unit**	**A1** [a]	**A2**
Normative	Origin and source ISO 17225-1			3.1.3.2 Shells/husks	3.1.3.2 Shells/husks
	Particle size[b] EN 15149-1 ISO 17827-1	Fines, F <2 mm	as received, w-% wet basis	< 2	< 2
	Oil content, ISO 659		w-% dry	To be updated	To be updated
	Moisture, M, EN 14774-1, EN 14774-2 ISO 18134-1; ISO 18134-2		as received, w-% wet basis	M12 ≤ 12	M12 ≤ 12
	Ash, A, EN14775 ; ISO 18122		w-% dry	A0.7≤ 0,7	A1.6≤ 1,6
	Net calorific value, Q, EN 14918 ; ISO 18125		as received, MJ/kg or kWh/kg	Q15.0 Q ≥ 15,0 or Q ≥ 4,2	Q15.0 Q ≥ 15,0 or Q ≥ 4,2
	Bulk density, BD, EN 15103 ISO 17828		kg/m^3	BD300 ≥ 300	BD300 ≥ 300
	Nitrogen, N, EN 15104 ISO 16948		w-% dry	N0.4 ≤ 0,4	N0.6 ≤ 0,6
	Sulphur , S, EN 15289 ISO 16994		w-% dry	S0.03 ≤ 0,03	S0.03 ≤ 0,03
	Chlorine, Cl, EN 15289 ISO 16994		w-% dry	Cl0.02 ≤ 0,02	Cl0.03 ≤ 0,03
	Arsenic, As, EN 15297 ISO 16968		mg/kg dry	≤ 0,5	≤ 0,5
	Cadmium, Cd, EN 15297 ISO 16968		mg/kg dry	≤ 1	≤ 1
	Chromium, Cr, EN 15297 ISO 16968		mg/kg dry	≤ 15	< 15
	Copper, Cu, EN 15297 ISO 16968		mg/kg dry	≤ 20	≤ 20
	Lead, Pb, EN 15297 ISO 16968		mg/kg dry	≤ 15	≤ 15
	Mercury, Hg, EN 15297 ISO 16968		mg/kg dry	≤ 0,01	≤ 0,01
	Nickel, Ni, EN 15297 ISO 16968		mg/kg dry	≤ 15	≤ 15
	Zinc, Zn, EN 15297 ISO 16968		mg/kg dry	≤ 100	≤ 100

[a] Class A1 is specific for grounded and sieved shells
[b] 100% of the mass must pass through a 31,5 mm sieve

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

9. **Walnut shells**. Quality specifications according deliverable D.3.3. of BIOMASUD PLUS project (table 9)

	Property class /Analysis method		**Unit**	**A1** [a]	**A2**
Normative	Origin and source ISO 17225-1			3.1.3.2 Shells/husks	3.1.3.2 Shells/husks
	Particle size[b] EN 15149-1 ISO 17827-1	Fines, F <2 mm	as received, w-% wet basis	< 2	< 2
	Oil content, ISO 659		w-% dry	To be updated	To be updated
	Moisture, M, EN 14774-1, EN 14774-2 ISO 18134-1; ISO 18134-2		as received, w-% wet basis	M12 ≤ 12	M12 ≤ 12
	Ash, A, EN14775 ; ISO 18122		w-% dry	A0.7≤ 0,7	A1.6≤ 1,6
	Net calorific value, Q, EN 14918 ; ISO 18125		as received, MJ/kg or kWh/kg	Q16.0 Q ≥ 16,0 or Q ≥ 4,4	Q16.0 Q ≥ 16,0 or Q ≥ 4,4
	Bulk density, BD, EN 15103 ISO 17828		kg/m^3	BD250 ≥ 250	BD200 ≥ 200
	Nitrogen, N, EN 15104 ISO 16948		w-% dry	N0.4 ≤ 0,4	N0.6 ≤ 0,6
	Sulphur , S, EN 15289 ISO 16994		w-% dry	S0.03 ≤ 0,03	S0.03 ≤ 0,03
	Chlorine, Cl, EN 15289 ISO 16994		w-% dry	Cl0.02 ≤ 0,02	Cl0.03 ≤ 0,03
	Arsenic, As, EN 15297 ISO 16968		mg/kg dry	≤ 0,5	≤ 0,5
	Cadmium, Cd, EN 15297 ISO 16968		mg/kg dry	≤ 1	≤ 1
	Chromium, Cr, EN 15297 ISO 16968		mg/kg dry	≤ 15	< 15
	Copper, Cu, EN 15297 ISO 16968		mg/kg dry	≤ 20	≤ 20
	Lead, Pb, EN 15297 ISO 16968		mg/kg dry	≤ 15	≤ 15
	Mercury, Hg, EN 15297 ISO 16968		mg/kg dry	≤ 0,01	≤ 0,01
	Nickel, Ni, EN 15297 ISO 16968		mg/kg dry	≤ 15	≤ 15
	Zinc, Zn, EN 15297 ISO 16968		mg/kg dry	≤ 100	≤ 100

[a] Class A1 is specific for grounded and sieved shells
[b] 100% of the mass must pass through a 31,5 mm sieve

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10. **Olive tree prunings (chips for domestic small installations)**. Quality specifications according deliverable D.3.3. of BIOMASUD PLUS project.

Particle size thresholds according to ISO 17225-4 (table 10.1)

Dimensions (mm). ISO 17827-1					
Main fraction [a] (minimum 60 w-%). mm		**Fines fraction, w-% (< 3,15 mm)**	**Coarse fraction, w-%, (length of particle mm)**	**Max. length of particles [b], mm**	**Max. cross section area of the coarse fraction [c], cm^2**
P16S	3,15 mm < P ≤ 16 mm.	≤ 15 %	≤ 6% (> 31,5 mm)	≤ 45 mm	≤ 2 cm^2
P31S	3,15 ≤ P ≤ 31,5 mm	≤ 10%	≤ 6% (> 45 mm)	≤ 150 mm	≤ 4 cm^2
P45S	3,15 ≤ P ≤ 45 mm	≤ 10%	≤ 10% (> 63 mm)	≤ 200 mm	≤ 6 cm^2

[a] The numerical values (P-class) for dimension refer to the particle sizes passing through the mentioned round hole sieve size (ISO-17827-1). The lowest possible class should be stated. Only one class shall be specified for wood chips.

[b] Length and cross sectional area only have to be determined for those particles, which are to be found in the coarse fraction. Maximum 2 pieces of about 10 litre sample may exceed the maximum length, if the cross sectional area is < 0,5 cm^2

c For measuring the cross sectional area it is recommended to use a transparent set square, place the particle orthogonally behind the set square and estimate the maximum cross sectional area of this particle of the cm^2 pattern.

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Limits according to ISO 17225-4 (table 10.2)

	Property class /Analysis method	**Unit**	**A1**	**A2**
Normative	Origin and source ISO 17225-1		1.1.7 Segregated wood from gardens, parks, roadside maintenance, vineyards, fruit orchards and driftwood from freshwater	1.1.7 Segregated wood from gardens, parks, roadside maintenance, vineyards, fruit orchards and driftwood from freshwater
	Particle size, P ISO 17827-1	mm	to be selected from table 1	
	Moisture, M[a], ISO 17827-1 ISO 18134-2	as received, w-% wet basis	M10 ≤ 10 M25 ≤ 25	M35 ≤ 35
	Ash, A, ISO 18112	w-% dry	A1.0 ≤ 1,0	A1.5 ≤ 1,5
	Bulk density, BD, ISO 17828	kg/loose m^3 as received	BD150 ≥ 150 BD200 ≥ 200 BD250 ≥ 250	BD150 ≥ 150 BD200 ≥ 200 BD250 ≥ 250 BD300 ≥ 300
	Nitrogen, N, ISO 16948	w-% dry	Not applicable	Not applicable
	Sulphur , S, ISO 16994	w-% dry	Not applicable	Not applicable
	Chlorine, Cl, ISO 16994	w-% dry	Not applicable	Not applicable
	Arsenic, As, ISO 16968	mg/kg dry	Not applicable	Not applicable
	Cadmium, Cd, ISO 16968	mg/kg dry	Not applicable	Not applicable
	Chromium, Cr, ISO 16968	mg/kg dry	Not applicable	Not applicable
	Copper, Cu, ISO 16968	mg/kg dry	Not applicable	Not applicable
	Lead, Pb, ISO 16968	mg/kg dry	Not applicable	Not applicable
	Mercury, Hg, ISO 16968	mg/kg dry	Not applicable	Not applicable
	Nickel, Ni, ISO 16968	mg/kg dry	Not applicable	Not applicable
	Zinc, Zn, ISO 16968	mg/kg dry	Not applicable	Not applicable
	Ne t calorific value, Q, ISO 18125	MJ/kg or kWh/kg as received	Minimum value to be stated	

[a] Lowest possible property class to be stated. Certain boilers require minimum moisture content, which should to be stated. Moisture class M10 is for artificially dried wood chips

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10. Olive tree prunings (pellets for domestic small installations). Quality specifications according deliverable D.3.3. of BIOMASUD PLUS project. (table 11)

	Property class /Analysis method	**Unit**	**P1**	**P2**	**P3**
Normative	Origin and source ISO 17225-1		1.1.7 Segregated wood from gardens, parks, roadside maintenance, vineyards, fruit orchards and driftwood from freshwater	1.1.7 Segregated wood from gardens, parks, roadside maintenance, vineyards, fruit orchards and driftwood from freshwater	1.1.7 Segregated wood from gardens, parks, roadside maintenance, vineyards, fruit orchards and driftwood from freshwater
	Diameter, D [a] and Length L, [b], ISO 17829	mm	D06, 6 ± 1; 3,15 ≤ L ≤ 40 D08, 8 ± 1 3,15 ≤ L ≤ 40	D06, 6 ± 1; 3,15 ≤ L ≤ 40 D08, 8 ± 1; 3,15 ≤ L ≤ 40	D06 6 ± 1; 3,15 ≤ L ≤ 40 D08 8 ± 1; 3,15 ≤ L ≤ 40
	Moisture, M, ISO 18134-1, ISO 18134-2	as received, w-% wet basis	M10 ≤ 10	M10 ≤ 10	M10 ≤ 10
	Ash, A, ISO 18122	w-% dry	A0.7 ≤ 0,7	A1.2 ≤ 1,2	A2.0 ≤ 2,0
	Mechanical durability, DU, ISO 17831-1	as received, w-%	DU97.5 ≥ 97,5	DU97.5 ≥ 97,5	DU96.5 ≥ 96,5
	Fines F, ISO 18846	w-% as received	F1.0 ≤ 1,0	F1.0 ≤ 1,0	F1.0 ≤ 1,0
	Additives [c]	w-% dry	≤ 2 w-% Type and amount to be stated	≤ 2 w-% Type and amount to be stated	≤ 2 w-% Type and amount to be stated
	Net calorific value, Q, ISO 18125	as received, MJ/kg or kWh/kg	Q15.0 15,0 or Q4.2 Q ≥ 4,2	Q15.0 15,0 or Q4.2 Q ≥ 4,2	Q15.0 15,0 or Q4.2 Q ≥ 4,2
	Bulk density, BD, ISO 17828	kg/m^3	BD600 ≥ 600	BD600 ≥ 600	BD600 ≥ 600
	Nitrogen, N, ISO 16948	w-% dry	N0.3 ≤ 0,3	N0.5 ≤ 0,5	N1.0 ≤ 1,0
	Sulphur , S, ISO 16994	w-% dry	S0.04 ≤ 0,04	S0.05 ≤ 0,05	S0.05 ≤ 0,05
	Chlorine, Cl, ISO 16994	w-% dry	Cl0.02 ≤ 0,02	Cl0.02 ≤ 0,02	Cl0.03 ≤ 0,03
	Arsenic, As, ISO 16968	mg/kg dry	≤ 1	≤ 1	≤ 1
	Cadmium, Cd, ISO 16968	mg/kg dry	≤ 0,5	≤ 0,5	≤ 0,5
	Chromium, Cr, ISO 16968	mg/kg dry	≤ 10	≤ 10	≤ 10
	Copper, Cu, ISO 16968	mg/kg dry	≤ 10	≤ 10	≤ 10
	Lead, Pb, ISO 16968	mg/kg dry	≤ 10	≤ 10	≤ 10
	Mercury, Hg, ISO 16968	mg/kg dry	≤ 0,1	≤ 0,1	≤ 0,1
	Nickel, Ni, ISO 16968	mg/kg dry	≤ 10	≤ 10	≤ 10
	Zinc, Zn, ISO 16968	mg/kg dry	≤ 100	≤ 100	≤ 100
	Informative: Ash melting behavior [d], prEN15370	°C	Should be stated	Should be stated	Should be stated

[a] Actual diameter class (D06, D08) of pellets to be stated.
[b] Amount of pellets longer than 40 mm can be 1 w-%. Maximum length shall be < 45 mm.
[c] Type of additives to aid production, delivery or combustion (e.g., pressing aids, slagging inhibitors or any other additives like starch, corn flour, potato flour, vegetable oil,…). Also additives which are used after production, before unloading to end-user storages, shall be stated similarly (type and amount).
[d] All characteristic temperatures (shrinkage starting temperature (SST), deformation temperature (DT), hemisphere temperature (HT) and flow temperature (FT) in oxidizing conditions should be stated.

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ANNEX 2: SPECIFICATIONS OF DOMESTIC SOLID BIOFUELS FOR BIG INSTALLATIONS (>400KW)

11. **Wood pellets**. Limits according to ISO 17225-2 (table 12)

	Property class /Analysis method	**Unit**	**B**
Normative	Origin and source ISO 17225-1		1.1 Forest, plantation and other virgin wood 1.2 By-products and residues from wood processing industry 1.3 Used wood
	Diameter, D [a] and Length L, [b] ISO 17829	mm	D06 6 ± 1; 3,15 ≤ L ≤ 40 D08 8 ± 1; 3,15 ≤ L ≤ 40
	Moisture, M, ISO 18134-1, ISO 18134-2	as received, w-% wet basis	M10 ≤ 10
	Ash, A, ISO 18122	w-% dry	A2.0 ≤ 2,0
	Mechanical durability, DU, ISO 17831-1	as received, w-%	DU96.5 ≥ 96,5
	Fines F, ISO 18846	w-% as received	F1.0 ≤ 1,0
	Additives [c]	w-% dry	≤ 2 w-% Type and amount to be stated
	Net calorific value, Q, ISO 18125	as received, MJ/kg or kWh/kg	Q16.0 16,0 ≤ Q ≤ 19 or Q 4.4 4,4 ≤ Q ≤ 5,3
	Bulk density, BD, ISO 17828	kg/m^3	BD600 ≥ 600
	Nitrogen, N, ISO 16948	w-% dry	N1.0 ≤ 1,0
	Sulphur , S, ISO 16994	w-% dry	S0.05 ≤ 0,05
	Chlorine, Cl, ISO 16994	w-% dry	Cl0.03 ≤ 0,03
	Arsenic, As, ISO 16968	mg/kg dry	≤ 1
	Cadmium, Cd, ISO 16968	mg/kg dry	≤ 0,5
	Chromium, Cr, ISO 16968	mg/kg dry	≤ 10
	Copper, Cu, ISO 16968	mg/kg dry	≤ 10
	Lead, Pb, ISO 16968	mg/kg dry	≤ 10
	Mercury, Hg, ISO 16968	mg/kg dry	≤ 0,1
	Nickel, Ni, ISO 16968	mg/kg dry	≤ 10
	Zinc, Zn, ISO 16968	mg/kg dry	≤ 100
	Informative: Ash melting behavior [d], prEN15370	°C	Should be stated

[a] Actual diameter class (D06, D08) of pellets to be stated.
[b] Amount of pellets longer than 40 mm can be 1 w-%. Maximum length shall be < 45 mm.
[c] Type of additives to aid production, delivery or combustion (e.g., pressing aids, slagging inhibitors or any other additives like starch, corn flour, potato flour, vegetable oil,…). Also additives which are used after production, before unloading to end-user storages, shall be stated similarly (type and amount).
[d] All characteristic temperatures (shrinkage starting temperature (SST), deformation temperature (DT), hemisphere temperature (HT) and flow temperature (FT) in oxidizing conditions should be stated.

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12. **Wood chips**.

Particle size thresholds according to ISO 17225-4 (table 13.1)

Dimensions (mm). ISO 17827-1					
Main fraction [a] (minimum 60 w-%). mm		**Fines fraction, w-% (< 3,15 mm)**	**Coarse fraction, w-%, (length of particle mm)**	**Max. length of particles [b], mm**	**Max. cross section area of the coarse fraction [c], cm^2**
P16S	3,15 mm < P ≤ 16 mm.	≤ 15 %	≤ 6% (> 31,5 mm)	≤ 45 mm	≤ 2 cm^2
P31S	3,15 ≤ P ≤ 31,5 mm	≤ 10%	≤ 6% (> 45 mm)	≤ 150 mm	≤ 4 cm^2
P45S	3,15 ≤ P ≤ 45 mm	≤ 10%	≤ 10% (> 63 mm)	≤ 200 mm	≤ 6 cm^2

[a] The numerical values (P-class) for dimension refer to the particle sizes passing through the mentioned round hole sieve size (ISO-17827-1). The lowest possible class should be stated. Only one class shall be specified for wood chips.

[b] Length and cross sectional area only have to be determined for those particles, which are to be found in the coarse fraction. Maximum 2 pieces of about 10 litre sample may exceed the maximum length, if the cross sectional area is < 0,5 cm^2

c For measuring the cross sectional area it is recommended to use a transparent set square, place the particle orthogonally behind the set square and estimate the maximum cross sectional area of this particle of the cm^2 pattern.

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Limits according to ISO 17225-4 (table 13.2)

	Property class /Analysis method	**Unit**	**B1**	**B2**
Normative	Origin and source ISO 17225-1		1.1 Forest, plantation and other virgin wood[a] 1.2.1 Chemically untreated wood residues	1.1 Forest, plantation and other virgin wood[a] 1.2 By-products and residues from wood processing industry 1.3.1 Chemically untreated used Wood
Normative	Particle size, P ISO 17827-1	mm	to be selected from table 1	
Normative	Moisture, M[b], ISO 17827-1 ISO 18134-2	as received, w-% wet basis	Maximum value to be stated	
Normative	Ash, A, ISO 18112	w-% dry	A3.0 ≤ 3,0	
Normative	Bulk density, BD [c], ISO 17828	kg/loose m^3 as received	Minimum value to be stated	
Normative	Nitrogen, N, ISO 16948	w-% dry	N1.0 ≤ 1,0	
Normative	Sulphur , S, ISO 16994	w-% dry	S0.1 ≤ 0,1	
Normative	Chlorine, Cl, ISO 16994	w-% dry	Cl0.05 ≤ 0,05	
Normative	Arsenic, As, ISO 16968	mg/kg dry	≤ 1	
Normative	Cadmium, Cd, ISO 16968	mg/kg dry	≤ 2,0	
Normative	Chromium, Cr, ISO 16968	mg/kg dry	≤ 10	
Normative	Copper, Cu, ISO 16968	mg/kg dry	≤ 10	
Normative	Lead, Pb, ISO 16968	mg/kg dry	≤ 10	
Normative	Mercury, Hg, ISO 16968	mg/kg dry	≤ 0,1	
Normative	Nickel, Ni, ISO 16968	mg/kg dry	≤ 10	
Normative	Zinc, Zn, ISO 16968	mg/kg dry	≤ 100	
	Ne t calorific value, Q [e], ISO 18125	MJ/kg or kWh/kg as received	Minimum value to be stated	

[a] Excluding classes 1.1.5 Stumps/roots and 1.1.6 Bark.

[b] Lowest possible property class to be stated. Certain boilers require minimum moisture content, which should to be stated. Moisture class M10 is for artificially dried wood chips

[c] The bulk density is lower for coniferous than for broad leaf wood

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13. **Olive Stones**. Limits based on UNE 164003 and updated with deliverable D3.3 of BIOMASUD PLUS project (table 14)

	Property class /Analysis method		**Unit**	**B**
Normative	Origin and source ISO 17225-1			3.1.2.3 Stone/kernel/ fruit fibre 3.2.1.2 Stone/kernel/ fruit fibre 3.2.2.2 Chemically treated Stone/ kernel/fruit fibre
	Particle size[b] EN 15149-1 ISO 17827-1	Fines, F < 2 mm	as received, w-% wet basis	< 15
	Oil content, ISO 659		w-% dry	≤ 3,0
	Moisture, M, EN 14774-1, EN 14774-2 ISO 18134-1; ISO 18134-2		as received, w-% wet basis	M16 ≤ 16
	Ash, A, EN14775; ISO 18122		w-% dry	A1.3≤ 1,3
	Net calorific value, Q, EN 14918; ISO 18125		as received, MJ/kg or kWh/kg	Q14.9 Q ≥ 14,9 or Q ≥ 4,1
	Bulk density, BD, EN 15103; ISO 17828		kg/m^3	BD600 ≥ 600
	Nitrogen, N, EN 15104; ISO 16948		w-% dry	N0.6 ≤ 0,6
	Sulphur , S, EN 15289; ISO 16994		w-% dry	S0.05 ≤ 0,05
	Chlorine, Cl, EN 15289; ISO 16968		w-% dry	Cl0.05 ≤ 0,05
	Arsenic, As, EN 15297; ISO 16968		mg/kg dry	≤ 0,5
	Cadmium, Cd, EN 15297; ISO 16968		mg/kg dry	≤ 0,05
	Chromium, Cr, EN 15297; ISO 16968		mg/kg dry	≤ 10
	Copper, Cu, EN 15297; ISO 16968		mg/kg dry	≤ 15
	Lead, Pb, EN 15297; ISO 16968		mg/kg dry	≤ 10
	Mercury, Hg, EN 15297; ISO 16968		mg/kg dry	≤ 0,01
	Nickel, Ni, EN 15297; ISO 16968		mg/kg dry	≤ 15
	Zinc, Zn, EN 15297; ISO 16968		mg/kg dry	≤ 100

[a] Olive stones can come from olive mills or oil extractor industries. If they come from oil extractor industries may have suffer a chemical treatment with hexane or other solvents for extracting the residual oil (this solvent is recovered later on). This extraction process and the solvent have to be declared. Olive stones treated with chemical additives such as salt or soda are excluded from this standard.

[b] 100% of the mass must pass through a 16 mm sieve

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14. **Almond Shells and Hazelnuts**. Limits based on UNE 164004 and updated with deliverable D3.3 of BIOMASUD PLUS project (table 15)

	Property class /Analysis method		**Unit**	**B**
Normative	Origin and source ISO 17225-1			3.1.3.2 Shells/husks
	Particle size[b] EN 15149-1 ISO 17827-1	Fines, F <2 mm	as received, w-% wet basis	< 4
	Oil content, ISO 659		w-% dry	≤ 1,5
	Moisture, M, EN 14774-1, EN 14774-2 ISO 18134-1; ISO 18134-2		as received, w-% wet basis	M16 ≤ 16
	Ash, A, EN14775		w-% dry	A2.0 ≤ 2,0
	Net calorific value, Q, EN 14918; ISO 18125		as received, MJ/kg or kWh/kg	Almond shells Q14.0 Q ≥ 14,0 Hazelnut shells Q15.0 Q ≥ 15,0
	Bulk density, BD, EN 15103 ISO 17828		kg/m^3	BD270 ≥ 270
	Nitrogen, N, EN 15104 ISO 16948		w-% dry	N0.8 ≤ 0,8
	Sulphur , S, EN 15289 ISO 16994		w-% dry	S0.05 ≤ 0,05
	Chlorine, Cl, EN 15289 ISO 16994		w-% dry	Cl0.04 ≤ 0,04
	Arsenic, As, EN 15297 ISO 16968		mg/kg dry	≤ 0,5
	Cadmium, Cd, EN 15297 ISO 16968		mg/kg dry	≤ 1
	Chromium, Cr, EN 15297 ISO 16968		mg/kg dry	< 15
	Copper, Cu, EN 15297 ISO 16968		mg/kg dry	≤ 20
	Lead, Pb, EN 15297 ISO 16968		mg/kg dry	≤ 15
	Mercury, Hg, EN 15297 ISO 16968		mg/kg dry	≤ 0,01
	Nickel, Ni, EN 15297 ISO 16968		mg/kg dry	≤ 15
	Zinc, Zn, EN 15297 ISO 16968		mg/kg dry	≤ 100

[a] Class A1 is specific for grounded and sieved shells
[b] 100% of the mass must pass through a 31,5 mm sieve

15. **Chopped pine cone**. Limits according to 164004 (table 16)

	Property class /Analysis method		**Unit**	**B**
Normative	Origin and source ISO 17225-1			3.1.3.2 Shells/husks
	Particle size[a] EN 15149-1 ISO 17827-1	Fines, F <1 mm	as received, w-% wet basis	≤ 2
		Fines, F <2 mm	as received, w-% wet basis	≤ 4
		Maximum nominal size	mm	≤ 45
	Moisture, M, EN 14774-1, EN 14774-2 ISO 18134-1; ISO 18134-2		as received, w-% wet basis	M16 ≤ 16
	Ash, A, EN14775 ISO 18122		w-% dry	A1.5 ≤ 1,5
	Net calorific value, Q, EN 14918; ISO 18125		as received, MJ/kg or kWh/kg	Q14.9 Q ≥ 14,9 or Q ≥ 4,1
	Bulk density, BD, EN 15103 ISO 17828		kg/m^3	BD300 ≥ 300
	Nitrogen, N, EN 15104 ISO 16948		w-% dry	N0.6 ≤ 0,6
	Sulphur , S, EN 15289 ISO 16994		w-% dry	S0.04 ≤ 0,04
	Chlorine, Cl, EN 15289 ISO 16994		w-% dry	Cl0.10 ≤ 0,10
	Arsenic, As, EN 15297 ISO 16968		mg/kg dry	≤ 0,5
	Cadmium, Cd, EN 15297 ISO 16968		mg/kg dry	≤ 2
	Chromium, Cr, EN 15297 ISO 16968		mg/kg dry	< 10
	Copper, Cu, EN 15297 ISO 16968		mg/kg dry	≤ 15
	Lead, Pb, EN 15297 ISO 16968		mg/kg dry	≤ 10
	Mercury, Hg, EN 15297 ISO 16968		mg/kg dry	≤ 0,01
	Nickel, Ni, EN 15297 ISO 16968		mg/kg dry	≤ 10
	Zinc, Zn, EN 15297 ISO 16968		mg/kg dry	≤ 20
[a] 100% of the mass must pass through a 31,5 mm sieve				

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16. **Pine nut shells**. Limits based on UNE 164004 and updated with deliverable D3.3 of BIOMASUD PLUS project (table 17)

	Property class /Analysis method		**Unit**	**B**
Normative	Origin and source ISO 17225-1			3.1.3.2 Shells/husks
	Particle size[a] EN 15149-1 ISO 17827-1	Fines, F <2 mm	**as received, w-% wet basis**	< 4
	Oil content, ISO 659		w-% dry	≤ 1,5
	Moisture, M, EN 14774-1, EN 14774-2 ISO 18134-1; ISO 18134-2		as received, w-% wet basis	M16 ≤ 16
	Ash, A, EN14775 ; ISO 18122		w-% dry	A2.0 ≤ 2,0
	Net calorific value, Q, EN 14918 ; ISO 18125		as received, MJ/kg or kWh/kg	Q15.0 Q ≥ 15,0 or Q ≥ 4,2
	Bulk density, BD, EN 15103 ISO 17828		kg/m^3	BD450 ≥ 450
	Nitrogen, N, EN 15104 ISO 16948		w-% dry	N0.8 ≤ 0,8
	Sulphur , S, EN 15289 ISO 16994		w-% dry	S0.05 ≤ 0,05
	Chlorine, Cl, EN 15289 ISO 16994		w-% dry	Cl0.04 ≤ 0,04
	Arsenic, As, EN 15297 ISO 16968		mg/kg dry	≤ 0,5
	Cadmium, Cd, EN 15297 ISO 16968		mg/kg dry	≤ 1
	Chromium, Cr, EN 15297 ISO 16968		mg/kg dry	< 15
	Copper, Cu, EN 15297 ISO 16968		mg/kg dry	≤ 20
	Lead, Pb, EN 15297 ISO 16968		mg/kg dry	≤ 10
	Mercury, Hg, EN 15297 ISO 16968		mg/kg dry	≤ 0,01
	Nickel, Ni, EN 15297 ISO 16968		mg/kg dry	≤ 15
	Zinc, Zn, EN 15297 ISO 16968		mg/kg dry	≤ 100

[a] 100% of the mass must pass through a 31,5 mm sieve

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17. **Pistachio shells**. Quality specifications according deliverable D.3.3. of BIOMASUD PLUS project (table 18)

	Property class /Analysis method		**Unit**	**B**
Normative	Origin and source ISO 17225-1			3.1.3.2 Shells/husks
	Particle size[a] EN 15149-1 ISO 17827-1	Fines, F <2 mm	**as received, w-% wet basis**	< 4
	Oil content, ISO 659		w-% dry	To be updated
	Moisture, M, EN 14774-1, EN 14774-2 ISO 18134-1; ISO 18134-2		as received, w-% wet basis	M16 ≤ 16
	Ash, A, EN14775 ; ISO 18122		w-% dry	A2.0 ≤ 2,0
	Net calorific value, Q, EN 14918 ; ISO 18125		as received, MJ/kg or kWh/kg	Q14.0 Q ≥ 14,0 or Q ≥ 3,9
	Bulk density, BD, EN 15103 ISO 17828		kg/m^3	BD270 ≥ 270
	Nitrogen, N, EN 15104 ISO 16948		w-% dry	N0.8 ≤ 0,8
	Sulphur , S, EN 15289 ISO 16994		w-% dry	S0.05 ≤ 0,05
	Chlorine, Cl, EN 15289 ISO 16994		w-% dry	Cl0.04 ≤ 0,04
	Arsenic, As, EN 15297 ISO 16968		mg/kg dry	≤ 0,5
	Cadmium, Cd, EN 15297 ISO 16968		mg/kg dry	≤ 1
	Chromium, Cr, EN 15297 ISO 16968		mg/kg dry	< 15
	Copper, Cu, EN 15297 ISO 16968		mg/kg dry	≤ 20
	Lead, Pb, EN 15297 ISO 16968		mg/kg dry	≤ 15
	Mercury, Hg, EN 15297 ISO 16968		mg/kg dry	≤ 0,01
	Nickel, Ni, EN 15297 ISO 16968		mg/kg dry	≤ 15
	Zinc, Zn, EN 15297 ISO 16968		mg/kg dry	≤ 100

[a] 100% of the mass must pass through a 31,5 mm sieve

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18. **Walnut shells**. Quality specifications according deliverable D.3.3. of BIOMASUD PLUS project (table 19)

	Property class /Analysis method		**Unit**	**B**
Normative	Origin and source ISO 17225-1			3.1.3.2 Shells/husks
	Particle size[a] EN 15149-1 ISO 17827-1	Fines, F <2 mm	as received, w-% wet basis	< 4
	Oil content, ISO 659		w-% dry	To be updated
	Moisture, M, EN 14774-1, EN 14774-2 ISO 18134-1; ISO 18134-2		as received, w-% wet basis	M16 ≤ 16
	Ash, A, EN14775 ; ISO 18122		w-% dry	A2.0 ≤ 2,0
	Net calorific value, Q, EN 14918; ISO 18125		as received, MJ/kg or kWh/kg	Q15.0 Q ≥ 15,0 or Q ≥ 4,2
	Bulk density, BD, EN 15103 ISO 17828		kg/m^3	BD200 ≥ 200
	Nitrogen, N, EN 15104 ISO 16948		w-% dry	N0.8 ≤ 0,8
	Sulphur , S, EN 15289 ISO 16994		w-% dry	S0.05 ≤ 0,05
	Chlorine, Cl, EN 15289 ISO 16994		w-% dry	Cl0.04 ≤ 0,04
	Arsenic, As, EN 15297 ISO 16968		mg/kg dry	≤ 0,5
	Cadmium, Cd, EN 15297 ISO 16968		mg/kg dry	≤ 1
	Chromium, Cr, EN 15297 ISO 16968		mg/kg dry	< 15
	Copper, Cu, EN 15297 ISO 16968		mg/kg dry	≤ 20
	Lead, Pb, EN 15297 ISO 16968		mg/kg dry	≤ 15
	Mercury, Hg, EN 15297 ISO 16968		mg/kg dry	≤ 0,01
	Nickel, Ni, EN 15297 ISO 16968		mg/kg dry	≤ 15
	Zinc, Zn, EN 15297 ISO 16968		mg/kg dry	≤ 100

[a] 100% of the mass must pass through a 31,5 mm sieve

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19. **Vineyards prunings (wood pellet for domestic big installations)**. Quality specifications according deliverable D.3.3. of BIOMASUD PLUS project (table 20)

	Property class /Analysis method	**Unit**	**PI1**	**PI2**	**PI3**
Normative	Origin and source ISO 17225-1		1.1.7 Segregated wood from gardens, parks, roadside maintenance, vineyards, fruit orchards and driftwood from freshwater	1.1.7 Segregated wood from gardens, parks, roadside maintenance, vineyards, fruit orchards and driftwood from freshwater	1.1.7 Segregated wood from gardens, parks, roadside maintenance, vineyards, fruit orchards and driftwood from freshwater
	Diameter, D [a] and Length L, [b] ISO 17829	mm	D06, 6 ± 1; 3,15 ≤ L ≤ 40 D08, 8 ± 1 3,15 ≤ L ≤ 40	D06, 6 ± 1; 3,15 ≤ L ≤ 40 D08, 8 ± 1; 3,15 ≤ L ≤ 40 D10, 10 ± 1; 3,15 ≤ L ≤ 40	D06, 6 ± 1; 3,15 ≤ L ≤ 40 D08, 8 ± 1; 3,15 ≤ L ≤ 40 D10, 10 ± 1; 3,15 ≤ L ≤ 40 D12, 12 ± 1; 3,15 ≤ L ≤ 40
	Moisture, M, ISO 18134-1, ISO 18134-2	as received, w-% wet basis	M10 ≤ 10	M10 ≤ 10	M10 ≤ 10
	Ash, A, ISO 18122	w-% dry	A3.5 ≤ 3,5	A4.0 ≤ 4,0	A4.5 ≤ 4,5
	Mechanical durability, DU, ISO 17831-1	as received, w-%	97,5 ≤ DU ≤ 99,0	97,0 ≤ DU ≤ 99,0	96,5 ≤ DU ≤ 99,0
	Fines F, ISO 18846	w-% as received	F4.0 ≤ 4,0	F5.0 ≤ 5,0	F6.0 ≤ 6,0
	Additives [c]	w-% dry	≤ 3 w-% Type and amount to be stated	≤ 3 w-% Type and amount to be stated	≤ 3 w-% Type and amount to be stated
	Net calorific value, Q, ISO 18125	as received, MJ/kg or kWh/kg	Q15.0 Q ≥ 15,0 or Q4.2 Q ≥ 4,2	Q15.0 Q ≥ 15,0 or Q4.2 Q ≥ 4,2	Q15.0 Q ≥ 15,0 or Q4.2 Q ≥ 4,2
	Bulk density, BD, ISO 17828	kg/m^3	BD600 ≥ 600	BD600 ≥ 600	BD600 ≥ 600
	Nitrogen, N, ISO 16948	w-% dry	N0.8 ≤ 0,8	N0.8 ≤ 0,8	N1.0 ≤ 1,0
	Particle size distribution of disintegrated pellets, ISO 17830	w-% dry	≥ 99% (<3.15 mm) ≥ 95% (<2.0 mm) ≥ 60% (<1.0 mm)	≥ 98% (<3.15 mm) ≥ 90% (<2.0 mm) ≥ 50% (<1.0 mm)	≥ 97% (<3.15 mm) ≥ 85% (<2.0 mm) ≥ 40% (<1.0 mm)
	Sulphur , S, ISO 16994	w-% dry	S0.05 ≤ 0,05	S0.06 ≤ 0,06	S0.06 ≤ 0,06
	Chlorine, Cl, ISO 16994	w-% dry	Cl0.03 ≤ 0,03	Cl0.05 ≤ 0,05	Cl0.1 ≤ 0,1
	Arsenic, As, ISO 16968	mg/kg dry	≤ 2	≤ 2	≤ 2
	Cadmium, Cd, ISO 16968	mg/kg dry	≤ 1,0	≤ 1,0	≤ 1,0
	Chromium, Cr, ISO 16968	mg/kg dry	≤ 15	≤ 15	≤ 15
	Copper, Cu, ISO 16968	mg/kg dry	≤ 30	≤ 40	≤ 50
	Lead, Pb, ISO 16968	mg/kg dry	≤ 20	≤ 20	≤ 20
	Mercury, Hg, ISO 16968	mg/kg dry	≤ 0,1	≤ 0,1	≤ 0,1
	Nickel, Ni, ISO 16968	mg/kg dry	≤ 30	≤ 30	≤ 30
	Zinc, Zn, ISO 16968	mg/kg dry	≤ 200	≤ 200	≤ 200
	Informative: Ash melting behavior [d], prEN15370	°C	Should be stated	Should be stated	Should be stated

[a] Actual diameter class (D06, D08) of pellets to be stated.
[b] Amount of pellets longer than 40 mm can be 1 w-%. Maximum length shall be < 45 mm.
[c] Type of additives to aid production, delivery or combustion (e.g., pressing aids, slagging inhibitors or any other additives like starch, corn flour, potato flour, vegetable oil,…). Also additives which are used after production, before unloading to end-user storages, shall be stated similarly (type and amount).
[d] All characteristic temperatures (shrinkage starting temperature (SST), deformation temperature (DT), hemisphere temperature (HT) and flow temperature (FT) in oxidizing conditions should be stated.

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1. **Olive tree prunings (pellets for domestic big installations)**. Quality specifications according deliverable D.3.3. of BIOMASUD PLUS project. (table 21)

	Property class /Analysis method	**Unit**	**PI1**	**PI2**	**PI3**
Normative	Origin and source ISO 17225-1		1.1.7 Segregated wood from gardens, parks, roadside maintenance, vineyards, fruit orchards and driftwood from freshwater	1.1.7 Segregated wood from gardens, parks, roadside maintenance, vineyards, fruit orchards and driftwood from freshwater	1.1.7 Segregated wood from gardens, parks, roadside maintenance, vineyards, fruit orchards and driftwood from freshwater
	Diameter, D [a] and Length L, [b], ISO 17829	mm	D06, 6 ± 1; 3,15 ≤ L ≤ 40 D08, 8 ± 1 3,15 ≤ L ≤ 40	D06, 6 ± 1; 3,15 ≤ L ≤ 40 D08, 8 ± 1; 3,15 ≤ L ≤ 40 D10, 10 ± 1; 3,15 ≤ L ≤ 40	D06, 6 ± 1; 3,15 ≤ L ≤ 40 D08, 8 ± 1; 3,15 ≤ L ≤ 40 D10, 10 ± 1; 3,15 ≤ L ≤ 40 D12, 12 ± 1; 3,15 ≤ L ≤ 40
	Moisture, M, ISO 18134-1, ISO 18134-2	as received, w-% wet basis	M10 ≤ 10	M10 ≤ 10	M10 ≤ 10
	Ash, A, ISO 18122	w-% dry	A3.5 ≤ 3,5	A4.0 ≤ 4,0	A4.5 ≤ 4,5
	Mechanical durability, DU, ISO 17831-1	as received, w-%	97,5 ≤ DU ≤ 99,0	97,0 ≤ DU ≤ 99,0	96,5 ≤ DU ≤ 99,0
	Fines F, ISO 18846	w-% as received	F4.0 ≤ 4,0	F5.0 ≤ 5,0	F6.0 ≤ 6,0
	Additives [c]	w-% dry	≤ 3 w-% Type and amount to be stated	≤ 3 w-% Type and amount to be stated	≤ 3 w-% Type and amount to be stated
	Net calorific value, Q, ISO 18125	as received, MJ/kg or kWh/kg	Q15.5 Q ≥ 15,5 or Q4.3 Q ≥ 4,3	Q15.5 Q ≥ 15,5 or Q4.3 Q ≥ 4,3	Q15.5 Q ≥ 15,5 or Q4.3 Q ≥ 4,3
	Bulk density, BD, ISO 17828	kg/m^3	BD550 ≥ 550	BD550 ≥ 550	BD550 ≥ 550
	Nitrogen, N, ISO 16948	w-% dry	N0.6 ≤ 0,6	N1.0 ≤ 1,0	N1.5 ≤ 1,5
	Particle size distribution of disintegrated pellets, ISO 17830	w-% dry	≥ 99% (<3.15 mm) ≥ 95% (<2.0 mm) ≥ 60% (<1.0 mm)	≥ 98% (<3.15 mm) ≥ 90% (<2.0 mm) ≥ 50% (<1.0 mm)	≥ 97% (<3.15 mm) ≥ 85% (<2.0 mm) ≥ 40% (<1.0 mm)
	Sulphur , S, ISO 16994	w-% dry	S0.05 ≤ 0,05	S0.08 ≤ 0,08	S0.15 ≤ 0,15
	Chlorine, Cl, ISO 16994	w-% dry	Cl0.04 ≤ 0,04	Cl0.05 ≤ 0,05	Cl0.1 ≤ 0,1
	Arsenic, As, ISO 16968	mg/kg dry	≤ 2	≤ 2	≤ 2
	Cadmium, Cd, ISO 16968	mg/kg dry	≤ 1,0	≤ 1,0	≤ 1,0
	Chromium, Cr, ISO 16968	mg/kg dry	≤ 15	≤ 15	≤ 15
	Copper, Cu, ISO 16968	mg/kg dry	≤ 30	≤ 40	≤ 50
	Lead, Pb, ISO 16968	mg/kg dry	≤ 20	≤ 20	≤ 20
	Mercury, Hg, ISO 16968	mg/kg dry	≤ 0,1	≤ 0,1	≤ 0,1
	Nickel, Ni, ISO 16968	mg/kg dry	≤ 30	≤ 30	≤ 30
	Zinc, Zn, ISO 16968	mg/kg dry	≤ 200	≤ 200	≤ 200
	Informative: Ash melting behavior [d], prEN15370	°C	Should be stated	Should be stated	Should be stated

[a] Actual diameter class (D06, D08) of pellets to be stated.
[b] Amount of pellets longer than 40 mm can be 1 w-%. Maximum length shall be < 45 mm.
[c] Type of additives to aid production, delivery or combustion (e.g., pressing aids, slagging inhibitors or any other additives like starch, corn flour, potato flour, vegetable oil,…). Also additives which are used after production, before unloading to end-user storages, shall be stated similarly (type and amount).
[d] All characteristic temperatures (shrinkage starting temperature (SST), deformation temperature (DT), hemisphere temperature (HT) and flow temperature (FT) in oxidizing conditions should be stated.

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ANNEX 3: CHECK LISTS

1. Check list for a producer

Phase	Action
Quality management system development	EN 15234-6 or ISO 9001
Internal documentation	• Raw materials including sustainability certification • Additives • Outgoing goods • Manufacturing of labelled and non-labelled biomasses • Malfunctions in production, storage and transport • Repair and maintenance work • Employee training records • Areas of responsibilities of the employees • Self-inspections, sampling and sample storage • Product declarations • Delivery to customer • Customer complaints
Application for certification	Communication to Biomasud Steering Committee or national entity/ies in charge of the quality label in the country
Selection of inspection body and testing organisation	See Biomasud website
Labelling	Labelling of bagged biomasses

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ANNEX 4: TEST METHODS FOR INTERNAL SAMPLING AND QUALITY CONTROL

The test methods listed are showed below as INFORMATION and are suitable for internal quality control of the certified producers. However, these methods are laboratory standards and it's NOT necessary to follow them exactly for these internal controls, others methods may be used if its validity is checked in the audition by the inspection body.

1. Sampling

As the procedures listed in the respective standards are very extensive, a simplified procedure for drawing samples for in-house analyses will be described in the following. Single samples (increments) should, if possible, be taken from the moving material, as the quality of the total batch can be best indicated in this way. During sample partitioning for the individual analyses, it should also be made certain that the respective subsamples represent the quality of the total batch. The subsamples should be taken with a small sampling scoop in order to assure that the fine material quantity can also be tested.

From moving material

At least five individual samples, with a mass of 4 kg per sample, will be taken. Attention should be paid that at least 20 kg of material passes through the sampling point between the individual sampling procedures. The individual samples will be thoroughly mixed and compiled into a cone. This will subsequently be pressed flat and divided into four equally large parts by a vertically inserted scoop. The process is to be so often repeated until the required sample size for the respective test is approximately achieved. Care must be taken to assure that all subsamples possess the same consistency.

From static material

At least five individual samples, with a mass of 4 kg per sample, are to be taken at different points of the filling process. With bagged wood pellets, an individual sample will be respectively taken from one bag. The individual samples will be thoroughly mixed and compiled into a cone. This will subsequently be pressed flat and divided into four equally large parts by a vertically inserted scoop. The process is to be so often repeated until the required

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sample size for the respective test is approximately achieved. Care must be taken to assure that all subsamples possess the same consistency.

2. Determination of overlength

The internal quality control has to ensure that the amount of pellets with a length > 40 mm is less than 1% of the pellet mass and that not a single pellet exceeds the maximum length of 45 mm. Experienced staff will find oversized pellets by visual inspection of the sample. The size of those pellets should be measured with a caliper that has a resolution of at least 0.1 mm.

For documentation it is sufficient to confirm the check for oversized pellets on the test protocols and make notes when pellets with overlength are found.

3. Mechanical durability (DU)

The determination of the mechanical durability is done on the basis of EN 15210-1 or the new ISO 17831-1. Firstly, two subsamples drawn from the sieved pellets, with a mass of (500 ± 10) g respectively, are formed and weighed. They are successively put into the testing chamber of the measuring device, which rotates at (50 ± 2) revolutions per minute. After 500 rotations, the drum is to be emptied and the fine material is to be sieved again. Afterwards, the remaining wood pellets will be weighed and the mechanical durability will be determined using the following formula:

$$DU = \frac{m_A}{m_E} * 100$$

DU mechanical durability [%]

m_e: mass of the pre-sieved wood pellets before the handling process [g]

m_a: mass of the sieved wood pellets after the handling process [g]

An average value will be generated from the results of the testing of both subsamples.

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An alternative procedure:

As an alternative, the mechanical durability can be determined according to the following testing instruction with the Ligno-Tester. The fines must be separated before determination of abrasion by manually passing according to EN 15210-1 / ISO 17831-1 through a sieve with 3.15 mm according to ISO 3310-1.

About 100 g ± 0.5 g pellets are weighed and treated in the Ligno-Tester for 60 seconds at 70 mbar by the flow of air. At the end, the pellets are weighed out and the abrasion in % is calculated.

The mean value is calculated from the results of 5 determinations. The dust filter of the Ligno-Tester must be changed, at latest, after every third determination. Mechanical durability is 100 % - AR.

$$AR = \frac{m_E - m_A}{m_E} \bullet 100$$

AR abrasion in w-%

m_e mass of pellets before treatment in g

m_a mass of pellets after treatment in g

The abrasion can also be determined by other methods giving equal results.

Note: On account of the expected divergence from the determination, a divergence of the mean value from the threshold value of an abrasion of up to 0.2 % must be accepted.

4. Bulk density (BD)

The determination of the bulk density follows on the basis of EN 15103 or the new ISO 17828.

Biomass will be poured from a height of 200 to 300 mm into a measuring cylinder, with a volume of five liters (or fifty for fuels with a nominal top size bigger than 12 mm.) and a defined diameter-height ratio, until the cylinder is full and a debris cone has formed. Subsequently, the cylinder will be dropped three times from a height of 150 mm onto a hard surface in order to consolidate the biomass. After excess material has been removed by striking a straight edge along the top and larger cavities have been filled, the mass of the biomass in the cylinder is determined.

The bulk density (BD) will be calculated using the following formula:

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$$BD = \frac{(m_2 - m_1)}{V}$$

BD	bulk density
m_1	mass of the empty container [kg]
m_2	mass of the full container [kg]
V	net volume of the measuring cylinder [m^3]

5. Moisture

Determining the moisture content may be effected by several methods depending on the biomass. There are some methods more suitable for some biomasses and other methods for other biomasses, mainly depending on the particle size.

It's very important in any of the methods used taking a representative sampling and follow the instrument manufacturer indications as malpractice may cause a significant error.

Thermal balance: The calculation of moisture is determined by weight loss experienced by the sample after being subjected to a heating process. The thermobalance is a combination of a microbalance with an oven, a temperature controller and a computer to control it allows the sample to be heated or cooled by measuring the weight change simultaneously versus the temperature or time.

This method is suitable for all biomasses with small particle sizes such as pellets (sample must previously crushed in a mortar), olive stone, etc.. Not suitable for wood chip unless the particle size reduced beforehand. It is a quite fast method to find the moisture.

Drying oven: The drying oven is an oven that is often used in laboratories to find moisture content according to the European standard EN 14774-2 or the new ISO 18134. It has more capacity than the thermal balance and is more accurate but has the disadvantage that it takes about 24 hours to dry the biomass sample. A scale should be used for recording weight variations.

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The moisture content is calculated using the following formula:

$$M = \left[\frac{(m_2 - m_3)}{(m_2 - m_1)} * 100 \right]$$

M M moisture content as received (w-%)
m_1 mass of the empty drying pan [g]
m_2 mass of the drying pan and sample before drying [g]
m_3 mass of the drying pan and sample after drying [g]

Indirect methods of measuring moisture

Indirect methods use the change in an electrical or structural characteristic of a material as a relationship of its moisture content. Common measurements used are changes in capacitance, conductivity, reaction to radio frequencies and absorption of electro magnetic radiation. Because these methods are indirect, a calibration against different known moisture amounts is needed. This extra step is often offset by the speed of obtaining a moisture measurement (Seconds instead of minutes or hours).

According to scientific literature (Nyström, J. 2003; Daugbjerg, J. et al 2006); The indirect method that today offers reliable results in online applications is the NIR (Near infrared spectroscopy). Many companies provide industry process adapted instruments based on this method. The working principle is that when a material is illuminated by IR, some of the light will be absorbed and some reflected. For every material an IR-spectra can be achieved by measuring the reflection from a surface. The spectrum depends, e.g. on the chemical composition, the density, and the moisture content of the material. NIR penetrates the sample deeper than IR (a few millimetres) and is therefore useful for measuring woodchips and other particulate biofuels. The NIR devices require to be calibrated for different biomass materials or when colour changes sensible occur within the same biomass product.

6. Particle size

Wood chips particle size is determined by taking a representative sample and separating the different fractions with the sieves. Then, the amount of separated material is weighted. Wood

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chips are classified by its particle size with the table we can found in Annex 2 table 2.1 extracted from ISO 17225-4 standard. Depending on the desired class (P16S, P31S or P45S) we would need different sieves.

7. Amount Fine Material (F)

The mass is determined by taking a sample of approximately 1.2 kg. Subsequently, the amount of fine material is separated with a sieve of 3.15 mm in pellets and wood chips according to the ISO-3310-2 and 1 to 2 mm. in the rest of the biofuels of as specified in this manual. When the screening is carried out manually in accordance with EN-15210-1 or the new ISO 18846, care should be taken that all the fine particles to be separated and, moreover, and that no more fine particles are formed by mechanical stress. This can be achieved by shaking the sample in 5 to 10 circular motions using a sieve with a diameter of 40 cm. Then sieved particles are weighed.

The fine material amount (F) will be calculated as follows:

$$F = \frac{m_A}{m_E} * 100$$

m_e mass of the sample before sieving

m_a mass of the sieved particles