



PRODUCTION AND USE OF WASTE AND WOOD CHIPS FROM FRUIT TREE PRUNING

USE OF WASTE AND WOOD CHIPS FOR LIVESTOCK FEED, FUEL AND OTHER USES OF AGRICULTURAL RESIDUES

BEST PRACTICE OBJECTIVE



The cultivation of fruit trees generates a significant number of sub-products. This biomass offers a great opportunity to the agricultural sector, since it is possible to recover all the productive potential with a minimum generation of surpluses, betting on the economic viability and respect for the environment. The sub-products obtained from these crops can be firewood, marc, pomace, pellets, etc., and can be used as fuel in homes and power plants, which implies a reduction in the consumption of fossil fuels. The remains of leaves, branches and splinters can be used by livestock for both feed and bedding.

THE ESSENCE OF THE PRACTICE



Spain has a great biomass richness coming from fruit crops due to the favourable conditions presented by the Mediterranean climate. The energy use of this biomass decreases the consumption of other non-renewable energy sources as well as it can be used by livestock, which reduces operating costs and gives an added value to fruit crops.

Pruning generates numerous biomass remains, such as firewood from certain species of pine used for heating, as well as certain types of firewood, mainly from holm oak, gall oak or cork oak, which can be used to produce charcoal. In recent years, wood chips from pruning have been used as a domestic fuel for the generation of thermal energy in homes through the use of pellets, as well as for energy production in many thermal plants.

One example is the production of extra virgin olive oil (EVOO) in the olive industry, where numerous sub-products are obtained, such as olive leaves, used for fodder and livestock feed. In addition, the olive industry generates pomace produced by the centrifugation and pressing of oil, destined to the production of electrical energy after drying, the pomace produced by the drying and extraction of oil from the pomace, with a high calorific value that can be used for the generation of thermal energy in industries producing electrical energy and finally they produce olive stones also used to generate energy. These sub-products from the olive grove are also used as fuel in many households. Other fruit tree crops such as citrus fruits (oranges or lemons) produce wood sub-products and branches from fruit or sanitary pruning.



Waste from the exploitation of the olive grove. The upper image shows forest biomass in a power plant (Source: La Biomasa en Andalucía, Junta de Andalucía) and the lower image shows firewood from pruning.



In addition to wood, other products that can be used as biomass are found in the wine sector, from which sub-products such as grape pomace are obtained, made up of the plant structure that supports the grape bunch, as well as the pulp and seeds. The lees also appear as solid residues that remain in the tanks after the fermentation of the grape. The potential of these resources is not very high at present although there are several projects that fight for the valorisation of this type of biomass as the CLAMBER in Castilla La Mancha.

TOOLS AND MACHINERY



The equipment for the transformation of biomass (such as pomace, pomace or wood pellets) into thermal energy for home heating is simple and environmentally friendly.

The main industries for the selection of biomass would be in oil mills and mills. Boilers are needed that recover the waste heat from biomass combustion gases, so that they heat the water in the exchanger and the primary heating circuit. The biomass is introduced into the tank, where the boiler itself starts the fire by dosing the fuel according to the demand of the household. When the boiler is switched on, a series of resistors are lit which burn the biomass. Heat sensors detect the flame and a ventilation system is started which distributes the hot air throughout the room, with the hot air coming out through biofuel stoves. From a control panel, the user can modify the temperature of the heating circuit and thermostat.

For the maintenance of the biomass boilers, the burner should be cleaned periodically with a vacuum cleaner (at least once a month).



Pomace boiler used for home heating.



PERIOD OF TIME AND PERIODICITY



The pellets are manufactured throughout the year, created from wood from surplus trees used for other purposes and from wood used for that purpose. The period of pomace production is generally during the olive harvest and the production of the AOVE, which by the process of centrifugation and pressing is obtained, approximately 73% of the products produced from the extraction of the oil are pomace. The pomace is produced through the pomace which is left to dry and undergoes an oil extraction process producing the pomace.

In the homes these natural fuels used for air conditioning and hot water are usually used during the cold season from November to February, depending on the climate of the place. However, in electricity generating companies and other types of factories they are consumed throughout the year for their various purposes (production of electricity, steam generation, etc.).

As with factories or industries for livestock bedding, they are also usually used annually.

ECONOMIC DATA



In most cases, the installation of one type of boiler or another is determined by the type of fuel to be used. Biomass boilers are the most expensive initially, although in the future they are the most profitable, as biomass has a much lower price than fossil fuels or electricity.

The price of the complete installation of the biomass boiler ranges from 1,600 - 8,000 euros, while the price of biomass varies according to the shape and characteristics, over 150 euros/ton - 200 euros/ton the price of pomace, the price of pomace is over 30 euros/ton and pomace pellets around 0.04 euros/kg or 0.55 euros/kg.

To estimate the cost of a biomass boiler will be approximately 0.26 € per kilogram of biomass to be used, consuming on average 1 kg / day. Taking into account the energy expenditure of 90 W/h, at the current price of the W/h it has would be a total of 0.0135 Approximately, the expenditure per hour will be around 0.30 €. Therefore, the total cost of using the biomass boiler will depend on the use made by the owner.

PRACTICAL EXAMPLE



Spain is the second country with the highest agricultural production in Europe, therefore, it is a strategic sector with great economic, social, territorial and environmental importance. The great diversity of crops generates a lot of agricultural waste, which can be reused for other purposes such as domestic heating.

This is the case of Manuel Ramírez, a resident of Villacarrillo, who four years ago changed his diesel oil boiler (a rather polluting fossil fuel) for a pellet boiler, which produced great economic savings in fuel per year and reduced environmental pollution without modifying the temperature of his home during the coldest winter months.



Installation of a pellet boiler in a home. The pictures from left to right: the boiler in operation, the storage of the pellets in the boiler and the pellet bags.

"I am very satisfied with the change I made, because for much less money I can have my house heated in winter and also reduce pollution to the environment. I recommend everyone to make the change because even if the investment starts to be somewhat high in a couple of years the investment is recovered".



Biomass for installers a technical course on calculation and installation of equipment carried out by the Extremadura Energy Agency |

https://www.agenex.net/images/stories/deptos/BIOMASA_INSTALADORES.pdf

Biomass in Andalusia, December 2017 |

https://www.agenciaandaluzadelaenergia.es/sites/default/files/documentos/la_biomasa_e_n_andalucia_diciembre_2017.pdf



Biomass: Pellet manufacturing process from pine wood | <https://youtu.be/O9UBp7QEhk0>

Biomass boilers | <https://youtu.be/boeHLO1Vh44>



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