Pruning Combustion and Relative Emissions Sampling for Energy Recovery

Beatrice Vincenti1, Adriano Palma1\*,Monica Carnevale1, Enrico Paris1, Andrea Colantoni2, Leonardo Bianchini2, Andrea R. Proto3, Francesco Gallucci1

1Council for Agricultural Research and Economics (CREA), Center of Engineering and Agro-Food Processing, Via della Pascolare 16, 00015 Monterotondo, (Italy)

2Tuscia University-Department of Agriculture and Forestry Science (UNITUS-DAFNE), Via San Camillo de Lellis snc, 01100 Viterbo, (Italy)

3Department of Agraria, University of Reggio Calabria, Feo di Vito snc 89122, Reggio Calabria, (Italy)

\*Corresponding author: [adriano.palma@crea.gov.it](mailto:adriano.palma@crea.gov.it)

**Keywords.** Biomass, Pruning, Combustion, Emissions, Energy

**Abstract.** In Italy, large quantities of lignocellulosic biomass are obtained from pruning operations carried out in fruit plantations. After olive, citrus and grapevine, already treated in other studies, plums are another source of great amounts of prunings every year. The most common practice to eliminate this type of residue is the open burning, carried out directly on the field by farmers, without any emissions control or energy recovery. For these reasons the need of studies able to understand the real energy potential of pruning reuse in combustion plants and the relative emissions produced is rising.

Biomass energy is carbon neutral if growing the biomass removes as much CO2 as is emitted into the atmosphere from its combustion. Biomass energy is carbon neutral only if the net life-cycle emissions are zero. Since many inputs today are forcing humanity to move forward through renewable resource utilization, the great availability of such lignocellulosic pruning, can really represent an alternative from the energetic point of view, that can be spread to all the farms with such byproducts in their production chain.

In this context combustion trials with plume woodchip were conducted in a 80 kW D’Alessandro GS/GSA boiler with the aim of characterize the biomass and the micropollutant emissions from combustion. The physicochemical properties were studied to determine their influence on combustion emissions. Biomass characterization measurements were conducted in laboratory and subsequently carbon monoxide (CO), carbon dioxide (CO2), oxygen (O2), nitrogen oxides (NOx), sulfur dioxide (SO2), and particulate matter (PM) emissions were evaluated during combustion. Due to the relative high humidity (23%) of the input biomass, the combustion process produced high CO emissions, confirming the necessity to dry the biomass and make it more suitable as possible for energy conversion processes. For NOx, SO2 and PM the values remain under the limits imposed by the regulations in force.