



Effect of feedstock type on chipping productivity, fuel consumption & quality



Natascia Magagnotti, Raffaele Spinelli

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Introduction

- Forest residues
- Recovery
- Chipping operation: many options but also many open questions



Goals

Tree species *softwood vs hardwood*

Tree portions *stem vs branches*

Moisture content *fresh vs dry*



Machine productivity

Fuel consumption

Particle size distribution

Materials and methods 1/3

- Pezzolato PTH 900/660
- Drum chipper on a trailer
- New set of knives
- 50 mm vertical bar screen



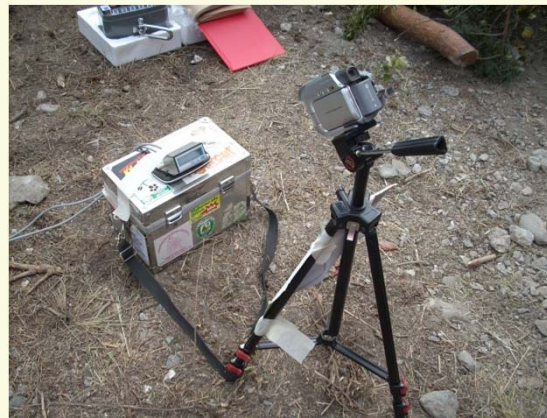
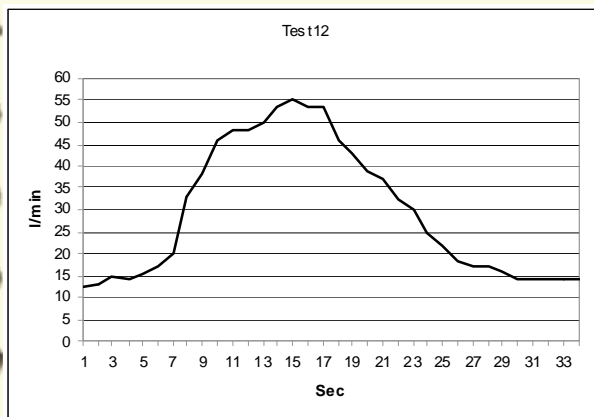
Materials and methods 2/3

- 8 different raw material types
- Species: european larch and common beech
- 5 replication per treatment
- Single grapple load per each treatment



Materials and methods 3/3

- Productivity *weight each replication*
- Fuel consumption *flow meter on injection pump line*
- Particle size distribution *collect sample*



Results 1/3

Treatment Code	Tree species	Tree part	Moisture content	Replications n°	Piece size kg (fresh)	Batch size kg (fresh)	m.c. %
SSF	Softwood	Stem	Fresh	5	34.8 ^b	326.6 ^a	38.8 ^{bc}
SBF	Softwood	Branches	Fresh	5	3.8 ^a	141.0 ^b	41.7 ^c
SSS	Softwood	Stem	Stored	6	24.2 ^b	174.3 ^b	41.4 ^c
SBD	Softwood	Branches	Dry	5	2.7 ^a	125.6 ^b	21.5 ^a
HSF	Hardwood	Stem	Fresh	5	23.5 ^b	243.6 ^a	37.4 ^{bc}
HBF	Hardwood	Branches	Fresh	5	3.6 ^a	119.0 ^b	34.9 ^b
HSD	Hardwood	Stem	Dry	5	40.5 ^c	271.4 ^a	20.8 ^a
HBD	Hardwood	Branches	Dry	6	2.4 ^a	126.3 ^b	19.5 ^a

Results 2/3

- *Net chipping productivity and fuel consumption*

Treatment code	Tree species	Tree part	Moisture content	Productivity		Consumption		
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SSF	Softwood	Stem	Fresh	27.4 ^b	16.7 ^d	45.7 ^b	1.68 ^b	2.74 ^{ab}
SBF	Softwood	Branches	Fresh	12.9 ^a	7.5 ^{ac}	28.1 ^a	2.20 ^{ab}	3.79 ^b
SSS	Softwood	Stem	Stored	21.3 ^b	12.4 ^b	37.7 ^{ab}	1.78 ^b	3.04 ^{ab}
SBD	Softwood	Branches	Dry	11.2 ^a	8.9 ^{ab}	30.8 ^a	2.86 ^a	3.66 ^{ab}
HSF	Hardwood	Stem	Fresh	22.9 ^b	14.3 ^{bd}	41.4 ^b	1.84 ^b	2.94 ^{ab}
HBF	Hardwood	Branches	Fresh	14.8 ^a	9.6 ^{abc}	31.8 ^a	2.17 ^{ab}	3.32 ^{ab}
HSD	Hardwood	Stem	Dry	16.4 ^{ab}	13.0 ^{bcd}	44.0 ^b	2.70 ^a	3.42 ^{ab}
HBD	Hardwood	Branches	Dry	14.8 ^a	11.9 ^b	31.0 ^a	2.11 ^{ab}	2.63 ^a

Results 3/3

- *Particle size distribution*

Treatment code	Tree species	Tree part	Moisture content	Oversize % weight	Large % weight	Medium % weight	Small % weight	Fines % weight	Accepts % weight
SSF	Softwood	Stem	Fresh	0.0 ^a	2.1 ^a	63.0 ^a	30.6 ^b	4.3 ^{ab}	95.7 ^a
SBF	Softwood	Branches	Fresh	6.4 ^b	17.7 ^b	61.1 ^a	11.7 ^a	3.1 ^{ab}	90.5 ^b
SSS	Softwood	Stem	Stored	0.2 ^a	4.8 ^a	56.4 ^a	35.9 ^b	2.7 ^a	97.1 ^a
SBD	Softwood	Branches	Dry	0.0 ^a	5.0 ^a	44.8 ^a	46.8 ^b	3.4 ^{ab}	96.6 ^a
HSF	Hardwood	Stem	Fresh	0.2 ^a	1.2 ^a	47.9 ^a	48.0 ^b	2.7 ^a	97.1 ^a
HBF	Hardwood	Branches	Fresh	1.8 ^a	6.6 ^a	60.6 ^a	24.1 ^a	6.9 ^b	91.3 ^b
HSD	Hardwood	Stem	Dry	0.0 ^a	1.3 ^a	28.2 ^a	68.0 ^c	2.5 ^a	97.5 ^a
HBD	Hardwood	Branches	Dry	1.0 ^a	4.3 ^a	50.4 ^a	41.0 ^b	3.3 ^{ab}	95.7 ^a

Conclusion

- Productivity and fuel consumption influenced mainly by piece size
- Particle size distribution influenced by tree part and moisture content



Contacts

- magagnotti@ivalsa.cnr.it
- www.biomassaforestale.org

