NATIONAL INSTITUTE OF RESEARCH – DEVELOPMENT FOR MACHINES AND INSTALLATIONS DESIGNED FOR AGRICULTURE AND FOOD INDUSTRY – INMA

INMA's R-D RESULTS IN THE FIELD OF RENEWABLE ENERGY

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The use of renewable energy has many potential benefits, including a reduction in greenhouse gas emissions, the diversification of energy supplies and a reduced dependency on fossil fuel markets (in particular, oil and gas). The growth of renewable energy sources may also stimulate employment in the EU, through the creation of jobs in new 'green' technologies.

Becoming the world's first climate-neutral continent by 2050 is the objective behind the European Green Deal (COM(2019) 640 final), the very ambitious package of measures that should enable European citizens and businesses to benefit from sustainable green transition.

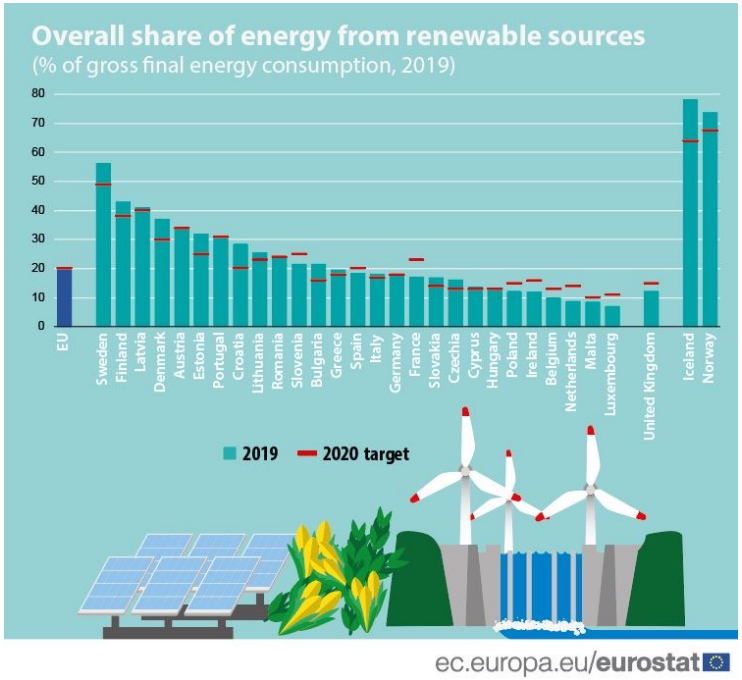
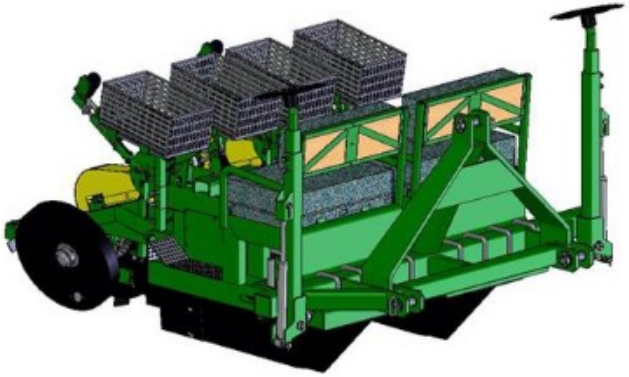


Fig. 1 – Overall share of energy from renewable sources

In order to fall in line with the actions for reducing the use of fossil fuels and increase the use of renewable sources for obtaining energy, INMA conducted a series of researches in this field, such as:

- Miscanthus planting;
- Miscanthus rhizomes harvesting;
- Miscanthus stems harvesting;
- Energy willow planting;
- Energy willow harvesting;
- Pelleting technologies;
- Briquetting technologies;
- Pelleting process optimization.



MISCANTHUS PLANTING MACHINE - MPM 4-0

TECHNICAL AND FUNCTIONAL CHARACTERISTICS

- Working width, m	2.8…4
- Distance between rows, mm	700…1000
- No. of planted rows, pcs.	4

ECHIPAMENT TEHNIC DE RECOLTARE A RIZOMILOR DE MISCANTHUS

TECHNICAL AND FUNCTIONAL CHARACTERISTICS

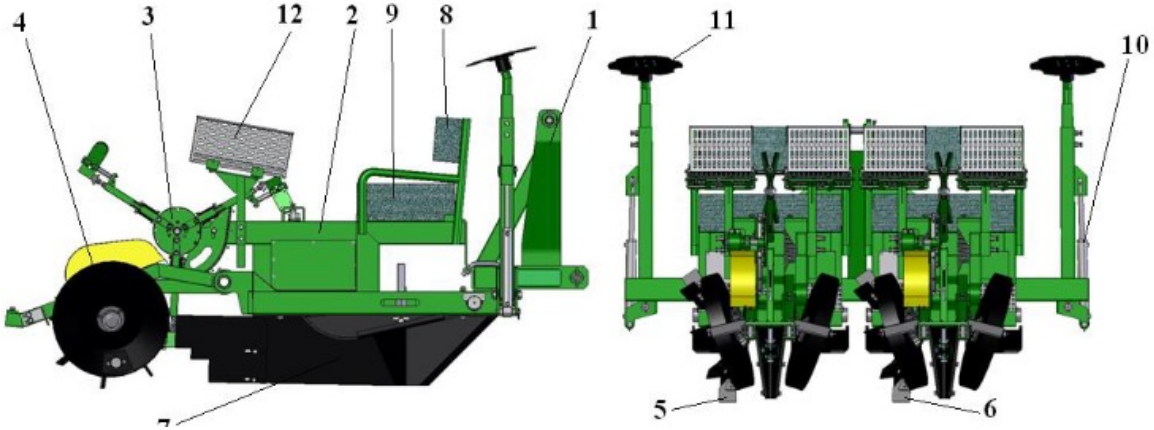
- Equipment type	carried
- Tractor power, HP	70...80
- Working width, m	1.2
- Working depth, cm	max. 25
- Separation conveyor drive mode	hydraulic
- Overall dimensions, mm	
- Width	2090
- Length	1590
- Height	1395
- Clearance, mm	350
- Mass, kg	565

EQUIPMENT FOR HARVESTING DRIED STEMS OF MISCANTHUS EPI

TECHNICAL AND FUNCTIONAL CHARACTERISTICS

- Equipment type	carried
- Constructive working width, m	1.6
- Number of rotors with fangs	2
- Type of cutting device,	with rotating disc
- Overall dimensions:	
- length, mm	1780
- width, mm	1730
- height, mm	1350
- Total mass, kg	485

EQUIPMENT FOR PLANTING ENERGY WILLOW - EIS



TECHNICAL AND FUNCTIONAL CHARACTERISTICS

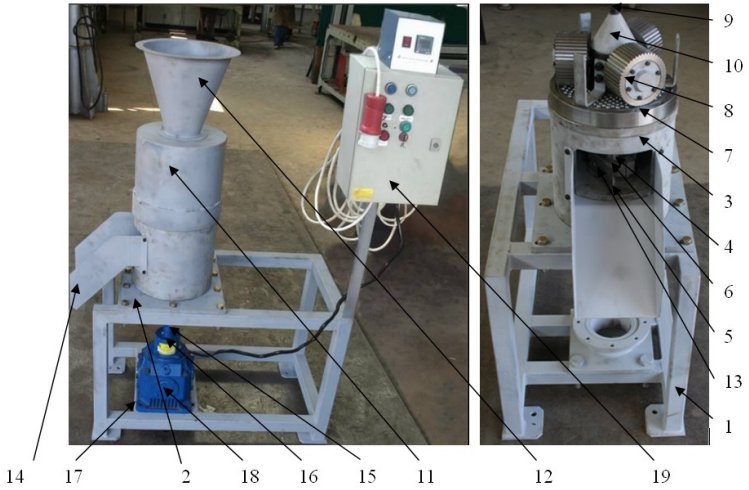
- Equipment type	carried
- Tractor power, HP	80...150
- Number of ploughshares, m	2
- Cuttings length, mm	180…250
- Cuttings diameter, mm	5…25
- Distance between plants on row, cm	75
- Distance between rows, cm	150
- Overall dimensions, mm	
- Length	2550
- Width	2000
- Height	1420
- Mass, kg	1150

EQUIPMENT FOR HARVESTING AND CUTTING ENERGY WILLOW - ETSE

TECHNICAL AND FUNCTIONAL CHARACTERISTICS

- Tractor power, HP	150
- Cuttings disc diameter, mm	750
- Cutting rotor diameter, mm	1150
- Number of cut rows	2
- Average diameter of cut stems, mm	40
- Overall dimensions, mm	
- Length	3319
- Width	4078
- Height	4696
- Mass, kg	3500

FLAT DIE PELLETING EQUIPMENT

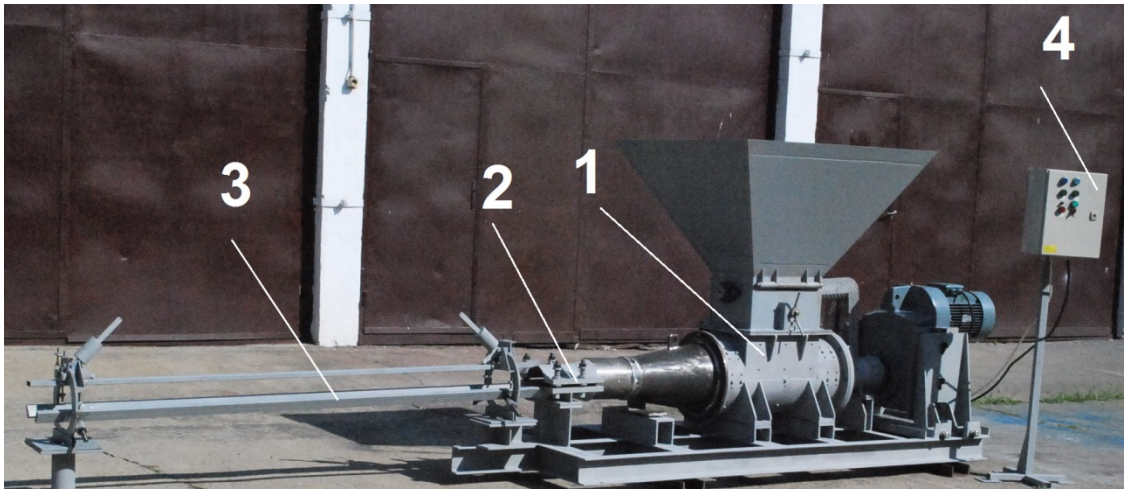


1 - frame; 2 – support plate; 3 - housing; 4 - shaft; 5 – evacuation rotor; 6 – cutting rotor; 7 - die; 8 – pressing assembly; 9 – shaft screw; 10 – direction cone; 11 – protection housing; 12 – feed funnel; 13 – greasing system; 14 – evacuation chute; 15 – coupling; 16 - gear motor shaft; 17 - gear motor support; 18 – gear motor; 19 – electrical installation.

TECHNICAL AND FUNCTIONAL CHARACTERISTICS

Working width, kg/h	1500
Installed power, kW	1.5
Electric motor rotation frequency, rev/min	1000
Screen rotation frequency, rev/ min	20
Die diameter, mm	630
Die orifice diameters, mm	ø 8, ø 10, ø 12, ø 14
Overall dimensions:	
length, mm	2460
width, mm	820
height, mm	1580

SAWDUST BRIQUETTING EQUIPMENT



1 – briquetting press; 2 - braking element; 3 - evacuation bed; 4 - electrical installation

TECHNICAL AND FUNCTIONAL CHARACTERISTICS

- briquetting press type	worm shaft mechanics;
- gear motor power, kw	7.5;
- motor rotation, min-1	1000;
- Screw rotation, min-1	15;
- the outer diameter of the briquette, mm	150;
- the inside diameter of the briquette, mm	60;
Overall dimensions:	
- length, mm	9418;
- width, mm	2538;
- height, mm	2400.

OPTIMIZING THE COMPOSITION OF BIOMASS MIXTURES TO OBTAIN HIGH QUALITY PELLETS

General objective: Optimizing the composition of biomass mixtures in order to increase the competitiveness of the economic agent (through knowledge transfer).

Following the successful implementation of the project, the biomass mixtures (recipes) used by the economic agent for the production of pellets, both for energy and for animal feed / bedding were optimized.

The recipes were optimized in order to obtain high quality pellets compared to those initially obtained by the economic agent by:

- improving the appearance and length;
- increase of unit density and bulk density;
- improving the nutritional quality of pellets for use as animal feed;
- improving the durability of pellets;
- decrease of technological dust resulting during the pelleting process.

Wheat straw 55% + Rapeseed stalks 30% + corn cobs 10% + dolomite 5%

Alfalfa 95% + sugar beat 5%

Alfalfa 95% + corn starch 5%

Wheat straw 95% + corn starch 5%

Thank you for your attention!