

Third Workshop of the 4FCROPS Project:

“Can the production of non-food crops be environmentally friendly and economically viable?” Poznan, 17 November 2009



CRA-ING
UNITÀ DI RICERCA
PER L'INGEGNERIA AGRARIA



How the choice of the logistic chain can influence on the environmental impacts of the agro-energy system

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Electricity generation using biomass as a fuel has recently received a great interest in Italy due to favourable government funding system. The fixed tariff of 0,3 €/kWh for electricity produced in small power plants (< 1 MWe) utilising biomass produced within an area of 70 km radius from the plant, has particularly encouraged electricity production at farm level. Farmers and farmer association are investing in this opportunity and poplar grown as Short Rotation Coppice (SRC) is the main crop utilised for this purpose.



CLAAS Jaguar harvester





Head GBE 1

Chip Storage tests



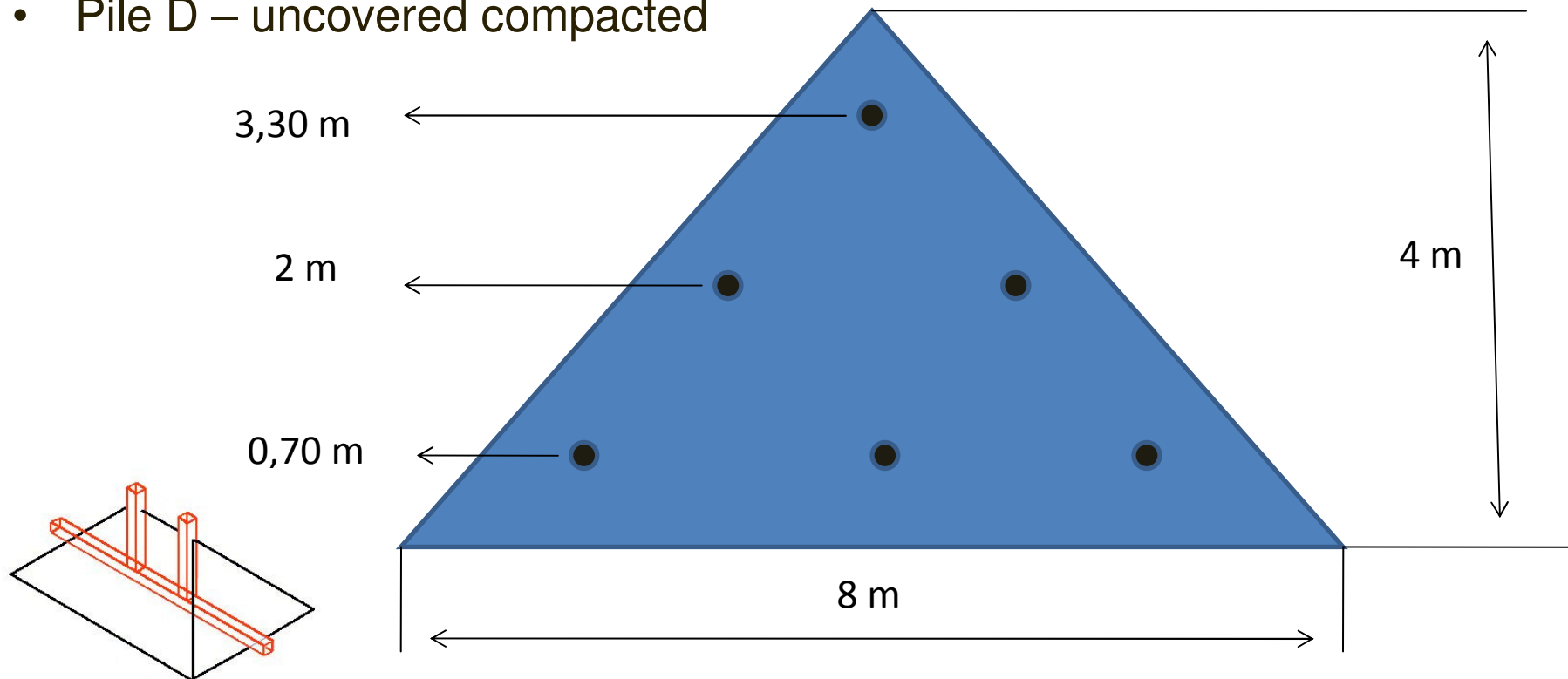
research programme to evaluate the performance of different storage systems for various particle sizes of poplar was carried out in Savigliano, Italy. The aim was to study the effect of particle size, pile covering, ventilation and compaction of chip piles on fuel quality parameters during outdoor storage.

Chips from 2-year old hybrid poplar (*Populus interamericana* x *Populus nigra*), harvested within few days using Claas Jaguar harvester, was used to build four chip piles.

Claas Jaguar chips has been evaluated in different storage conditions

- Pile A - uncovered ventilated
- Pile B – uncovered
- Pile C – Covered with top tex
- Pile D – uncovered compacted

Length 12 m



Chip Storage tests



Ventilated



Uncovered

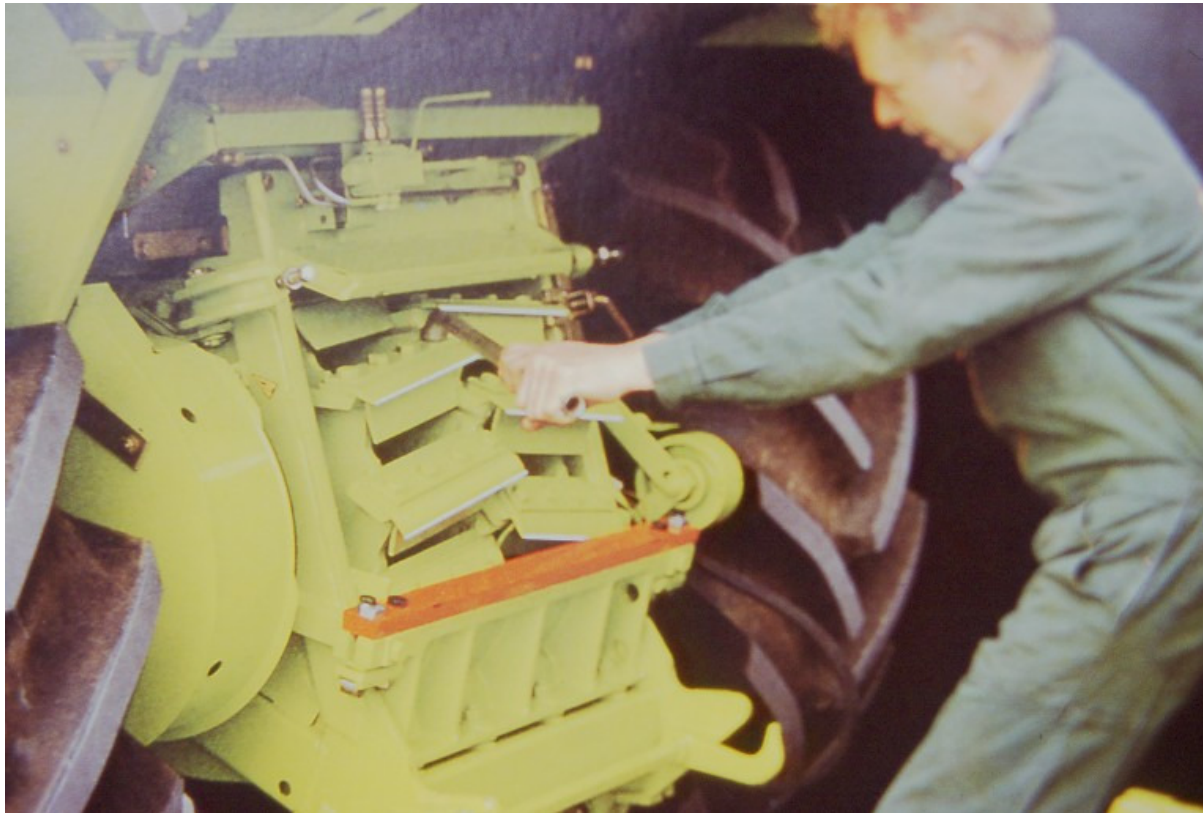


Covered



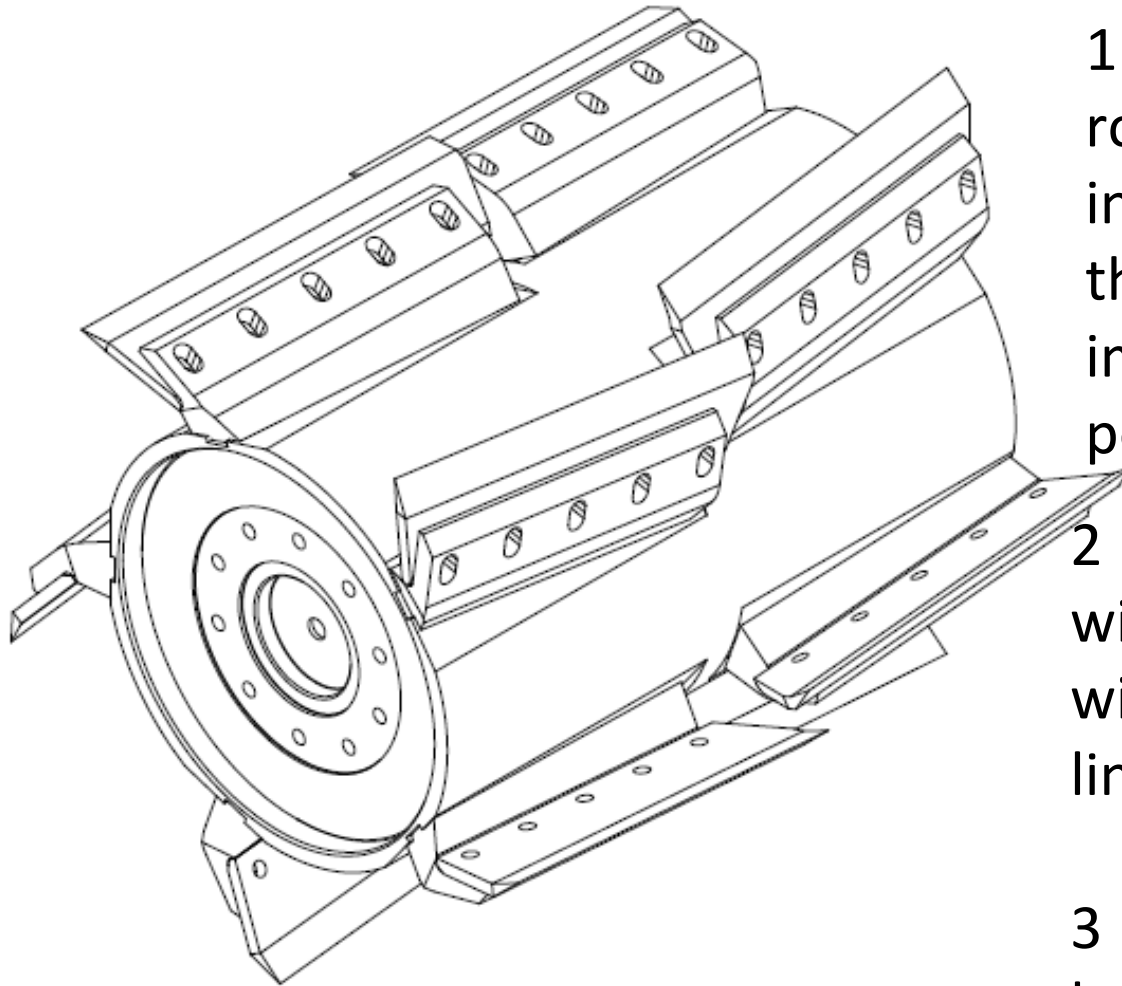
Compacted

Commercial chipping rotor



1. 24 knife
reduce to 12
2. 24 knife
holders
3. Chips are
broken
against the
knife
holders

CRA-ING Rotor (1/2)

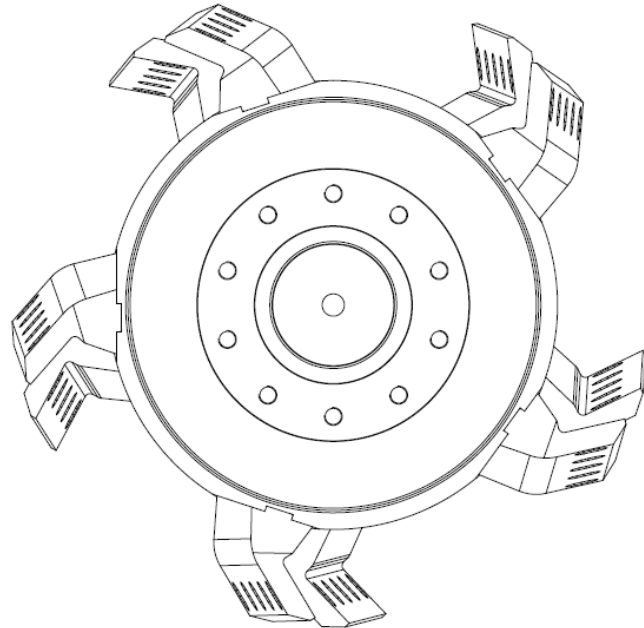


1. The innovative CRA-ING rotor was designed to increase the dimensions of the harvested chips and to improve harvester performances.

2 The knife holder was fixed with an inclination angle of 5° with respect to the straight lines of the rotor.

3 Knife holders are upon the knife

diameter= 403 mm, length=670 mm, weight= 145 kg



Each knife holder (length=320 mm) was equipped with five slots in order to fix and adjust the knife position to avoid contrast against chips.

The knife has a maximum length of 380 mm, with a cutting angle of 32.5°

Preliminary test on the *CRA-ING Rotor*



April 2008 - R4S2

Long period testing

Winter 2008 - 2009 — Harvested about 100 ha



Long period testing In collaboration with Enervision

Comparison of chips performance during storage :
Test under going



NEEDS TO DEVELOP A LOGISTIC CHAIN MORE ENVIRONMENTAL FRIENDLY



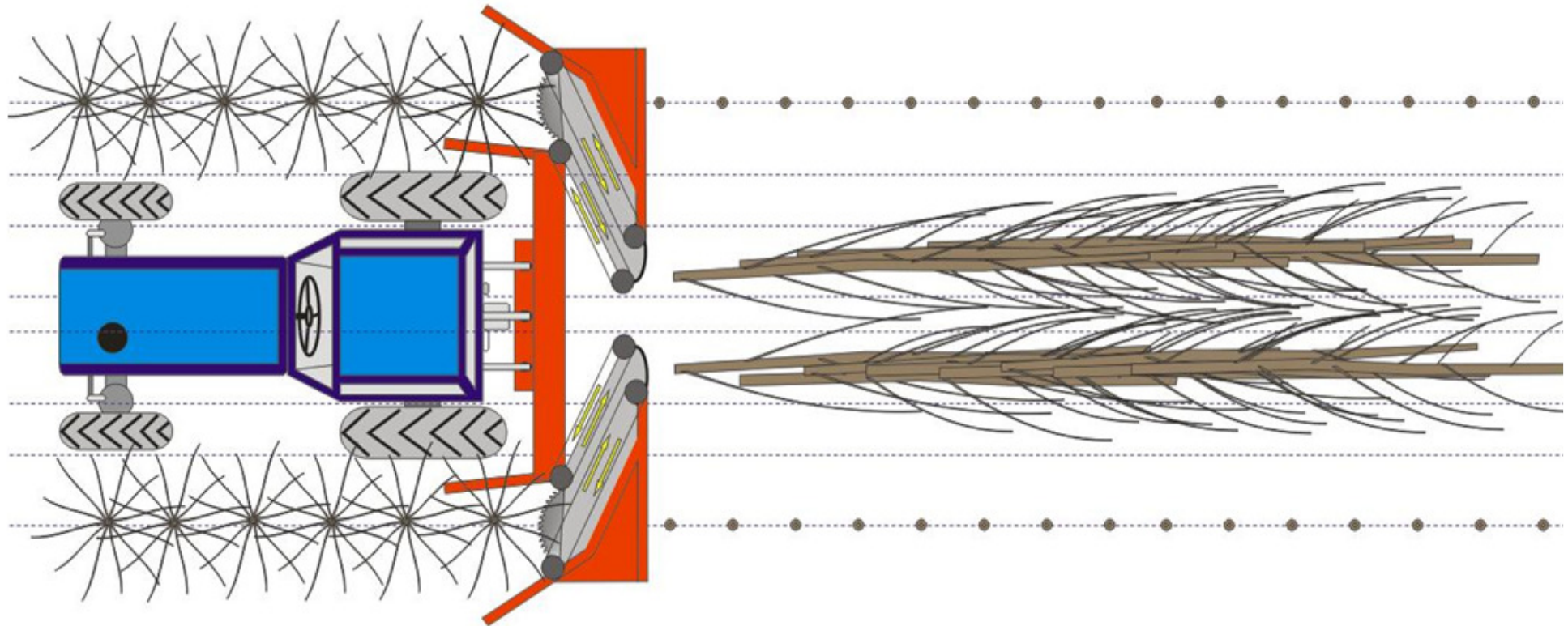
Developing of a logistic chain



...with low impact



Technical innovation



Prototype developed



- (a) Cutting system
- (b) Plants conveyor system
- (c) Plants transportation system
- (d) plants unloading system

Conclusions

- 1) The light, felling-windrowing machine was able to work during this rainy winter, postponing the use of the chopper and loader machine as well as trailers until April or May.
- 2) The machine, still in experimental phase, harvested 50 ha and showed good performance with a 1.20 ha/h working capacity.
- 3) This prototype is the first step for the development of the 2 rows felling-windrowing harvesters
- 4) Windrows were harvested and chipped by Spapperi, Jordan and Claas Jaguar equipped with pick up between March and May,
- 5) The moisture content during windrowing storage and the quality of the chip with different degrees of moisture are now under evaluation.
- 6) The new harvesting chain permit a low soil compaction, especially on clay soil and in rainy winters, less storage problem and to enlarge the harvesting period, in other words **TO DECREASE THE ENVIRONMENTAL IMPACT OF THE AGRO-ENERGY SYSTEM**

Thanks for your
attention



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