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Preliminary trials of one-pass windrowing of corn-stover with innovative corn header

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Objectives

The work focuses on agricultural residues originated at field level for their use for the production of bioenergy or bioethanol.

The theoretical potential of primary agricultural residues (eg corn stalks) that is available for energy or other applications from renewable sources from a specific crop is determined by: (i) the cultivated surface of a crop (ha), (ii) the availability of crop residues according to the harvesting system used. (iii) Last but not least is the availability of adequate technology and logistics to collect a high-quality residue. The use of residues is well acknowledged by the European Union as there is no competition with the food chain for the production of biomass as residues are produced on the same ground where food production takes place. Using residues also helps achieve the goals of using renewable energies (20-20-20 vision) for 2020 without competing on soil use with food productions.

The crop residues of corn stalks vary according to the cultivated variety. However, they are present in fairly large quantities (9.6-11.6 t SS ha⁻¹ year⁻¹), and this allows for economic exploitation for Biofuel, biogas and bioenergy supply chains .

However, their traditional harvesting involves a high residual soil that prevents the use, often limited to livestock as litter.

The main aim of the work is the development of an innovative corn grain harvester header to reduce costs of corn stover harvest.

Methods

For this research, a prototype of corn grain harvester header has been developed by OLIMAC srl, Margarita, Cuneo. This innovative header allows to carry out three operations in a single step (collection): grain harvesting, cutting and windrowing crop residues. At present, without this prototype, the last two operations are conducted separately.

To evaluate the functioning of the innovative device preliminary field tests have been carried out in Margarita comparing it with the traditional corn grain collection. These tests allow us to understand the potential of the prototype and further adjustments to be made to reach the expected improvement in corn stover harvest.

Results

The device has been shown to be effective to collect 48% of the product in one pass, absolutely free of soil residues, compared to 65% gathered with the traditional three passes.

This innovative device allows energy savings and emissions of about 30% compared to traditional harvesting that requires two further steps.



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Considering that 176000 hectares of grain maize are grown in the Piedmont Region, the proposed innovation will allow collecting about 550000 t y⁻¹ of clean corn stover, usable in the biogas or combustion / bioethanol , which at the commercial value of € 60 t⁻¹ would lead to an induced market of 33 M €.