

# Pelletizing straw and cornstalks at Bagioni



## Background

Bagioni Group is a consortium of companies involved in agriculture, livestock and energy sectors. Companies have been engaged for many years in the cultivation and trade of products for animal feed. Afterwards, the group has developed a strong interest in agri-energy, building a biogas plant for electricity production (850 kWe). Part of the heat energy produced by the power plant is used for drying the materials used for pellet productions. This makes possible saving energy and reducing the production costs of pellets and makes the process more sustainable.

## Raw material

The company has developed experience in the production of alfalfa pellet material. However, other biomasses are involved (and will be involved) in the production of pellets for energy use. Among them: straw, corn stalks, residues of maize, pruning of trees, plants extirpated and also various types of wood (mixed with other biomasses).

The production of these crops is highly variable. In the case of straw, the production can range from 3 to 5 t/ha dry matter, depending on the kind of crop (maize, sorghum,...). The biomass moisture content at harvest time can vary from 30% to 40%. Pruning trees production can range in average from 1.5 to 3 t/ha dry matter depending on the type of training system and the residual crop. The moisture content during harvest time can vary from 40% to 50%.

Corn stalks production is over 3.5 t/ha of dry matter. Bulk density of the raw material varies between 120 and 180 kg/m<sup>3</sup>. The pellet production process increases the bulk density of about 3.5/4.5 times and improves the stability of the final product with less moisture content.

The crops are harvested using different machinery systems. Straw material is available during the summer time (June and July preferably) after the

threshing. The material, left in the fields for a short period of time, loses part of the moisture content; then it is stored in covered barns. The product is handled with the traditional transport machinery used for forage. Corn stalks are stored in bales (300 – 500 kg). Good storage conditions could reduce significantly the moisture content of the materials up to 20-25%.

Prices of the material varies between 25 and 35 €/ton (transport excluded). The quality of the material depends on the kind of biomass and the conditions of its working. It's important to avoid picking up the soil from the ground during the harvesting: in this way, the level of ash can be kept low and the consumption of the die for the production of pellets can be reduced.

In the following table the characteristics of the materials are shown.

*Raw material characteristics.*

|                            | <b>Corns-talks</b> | <b>Pruning tree</b> |
|----------------------------|--------------------|---------------------|
| Moisture content %         | 35-45              | 35-40               |
| Heating value MJ/kg        | 16.5-17.0          | 17.0-18.0           |
| Ash content %              | 6-7%               | 3-6%                |
| Ash melting temperature °C | 1200               | 1300                |
| Chlorine %                 | 0.05-0.06          | 0.03-0.04           |
| Sulfur %                   | 0.08               | 0.01                |
| Nitrogen %                 | 0.8                | 0.5                 |
| Cost of material €/t       | 25-35              | 40-50               |

## Pelletising process

The pellet plant of Bagioni Group has a production capacity of 15000 t/y working on three production lines. Great part of the production is currently used for animal feed.



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For the production of mixture pellet, made of agricultural residues and wood, the product is loaded onto conveyor belts and then mixed.



*Corn stalks and sorghum stalks bales close to the conveyor belt.*

A hammer mill grinder is used and the material goes through a sieve of Ø20 mm before the drying. This process takes place in a drum rotating cylinder dryer until the material reaches a moisture content of 12-14%. A belt conveyor transports the raw material to the pelletizing machineries (flat and ring die).



*Drum rotary drier.*

At the moment, the producer has ring dies of 6 and 8 mm (28 mm for hard material – 50 mm for soft

material) and no additives are used. Model of pelletizing machinery is Matador 30.

The moisture content before the pellet process is between 10-14% depending on the raw materials. Just produced pellets reach a temperature of 90 °C, then they are cooled by air and the dust is removed from the product.

Production costs, without considering the raw material cost, range from 50 to 80 €/t.



*Internal view of pelletizing machinery.*

## Producers view

Bagioni group considers the production of pellets for energy an important alternative to the livestock sector (animal feed). It's interesting to consider that this company can utilize the low-cost heat produced by the biogas plant. This opportunity reduces the cost of the raw material drying and especially for the wood, used with alternative biomasses to obtain a better quality pellet.

## Contact

EUROFORAGGI Società Agricola S.r.l. - V. Serachieda, 1/C - 47122 Forlì (FC) - tel: 0543 729628 - fax:0543 729833

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