

# III INTERNATIONAL Chestnut Congress



**Forte de S. Francisco Hotel  
Chaves, October 20-23, 2004**



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THE USE OF A ROTAVATOR EQUIPMENT AS A NEW SOIL MANAGEMENT PRACTICE IN  
CHESTNUT ORCHARDS: EFFECT ON VEGETATION CONTROL, ORGANIC RESIDUES  
PROCESSING AND SOIL PHYSICAL PROPERTIES

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Chestnut orchards have a high economic and ecology importance in the rural environment of Northern Portugal. Previous studies have shown the need of new management practices in those agro-ecosystems in order to improve its productivity and sustainability and one of the envisaged techniques is the use of new equipment which destroys the vegetation under canopy and crushes the organic residues without disturbing the soil.

The equipment that was used in the present study, as an alternative to the traditional tillage using tine cultivator, have 1.3 m work width and allows a partial incorporation of leaves and burs in the soil and the control of weeds. Supported by a new project, that system have been used (NTR plots) and compared with the traditional tillage, irrigated seeded pasture, unirrigated seeded pasture and the maintenance of natural vegetation cover, under canopy.

The obtained results related to the equipment operation, and the effects on the vegetation, on the residues processing and on the physical properties of the soil, are reported. The methodology used in the trials consists of different equipment's velocity, at the PTO standard regime (540 rpm), which enables the breaking in different sizes of the vegetal ground surface material, especially the leaves and burs, and simultaneously the light mobilization of the soil, allowing the partial incorporation of that material. As smaller the size of this material as faster the humification process and less intense is its removing from the soil surface by the wind, which is important to the nutrient cycling.

Based on the trial results, the best compromise between the high work rate, which comes closer to the work rate of the tine cultivator, and the small size of the crushed material (leaves, burs and weeds), were selected. Considering that increasing the tractor's velocity,

keeping with the PTO regime, from 1.12 to 3.58 km/h, the leaf's area increases from 1916.01 to 2417.02 mm<sup>2</sup>, the highest recommended equipment's velocity is 2.0 km/h, which corresponds to 3.79 h/ha work rate, near half of the work rate of the tine cultivator (1.92 h/ha), as a reference; the average area of the entire leaves is 4845.50 mm<sup>2</sup>.

Related to the effects on soil physical properties, soil compaction was measured with an Eijkelkamp Penetrologger device, making 30 measures in the soil under the canopy of each tree, on 3 trees by treatment. The obtained results showed a higher compacity on soil surface of NTR plots, which causes unfavourable soil physical conditions and rises the need of new studies of a improved equipment, in order to take advantage of the benefits and avoid the previous risk of increasing soil compaction. So, new tests are being carried out with this equipment and with similar ones trying to find the best solution for this operation.