

# JAE

vol. XLVII:s1  
2016 May

Official Journal of the Associazione Italiana  
di Ingegneria Agraria



## **Mechanization and new technologies for the control and the sustainability of agricultural and forestry systems**

DOI: 10.4081/jae.2016.567

**Alghero, Italy, 29<sup>th</sup> May - 1<sup>st</sup> June 2016**

# **Journal of Agricultural Engineering**

open access journal - ISSN 1974-7071 - [www.agroengineering.org](http://www.agroengineering.org)

ing duration time acquired in field, almost ranged between 3.2 and 6.4 ms<sup>-2</sup>. The results highlighted the high values of acceleration transmitted to the hand-arm system produced by the examined eight chainsaws: the vibration values are greatly higher than the limit ones laid down in the Italian law. The most effective way to prevent vibration reaching worker's hands is to avoid using processes which require workers to hold vibrating surfaces. When the use of vibrating equipment is unavoidable, it is often possible to control the vibration transmitted to the hand.

## USING A GIS TECHNOLOGY TO PLAN AN AGROFORESTRY SUSTAINABLE SYSTEM IN SARDINIA

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Key words: Agroforestry, GIS, Sustainability, Sardinia.

This study was conducted with the aim to quantify the spread of livestock agroforestry in a Mediterranean ecosystem (island of Sardinia, Italy) and evaluate its sustainability in terms of grazing impact. By using GIS software ArcMap 10.2.2, the map of Sardinia vegetal landscape, obtained by information of Sardinia nature map based on the classification of habitat according to CORINE-Biotopes system, have been overlaid with the map of livestock grazing impact map CAIA developed by INTREGA (spin-off ENEA), to obtain for Meriagos (local agro-silvo-pastoral systems; classified "Dehesa 84.6" according to CORINE-Biotopes system), bushlands and woodlands, the surfaces under grazing and evaluate the extension of overgrazing for each of them. Results are reported in the Table 1.

Table 1. Livestock agroforestry area in Sardinia (Italy) and grazing impacts.

MERIAGOS			BUSHLANDS			WOODLANDS		
Grazed surface (ha)	Grazing impact	%	Grazed surface (ha)	Grazing impact	%	Grazed surface (ha)	Grazing impact	%
10.361	none	10	29.636	none	6	29.122	none	7
15.726	negligible	14	43.198	negligible	9	42.625	negligible	11
18.165	light	17	48.686	light	10	43.424	light	11
29.249	medium	27	88.808	medium	18	82.712	medium	21
35.183	high	32	279.956	high	57	205.437	high	51
Total grazed surface			Total grazed surface			Total grazed surface		
108.684		96	490.284		76	403.319		72
Total surface		10	Total surface		10	Total surface		10
112.668		0	645.726		0	560.984		0
No grazed surface			No grazed surface			No grazed surface		
3.984		4	155.442		24	157.665		28

In Sardinia forests *lato sensu* cover a surface of 1.319.378 hectares (54% of the total island area), the 8.6% of which are Meriagos, the 48.9% bushlands and the 42.5% woodlands. Fairly 1 million of hectares are grazed (76% of total), with the higher value, obviously, for the Meriagos, and the minimum for the woodlands (72%). High impact of grazing resulted in more than half of grazed surface (521.576 ha) with the maximum for the bushlands and minimum for the Meriagos. Data indicate that this productive model represents a great environmental resources for animal production in Mediterranean areas. Consequently, such massive overgrazing may jeopardize the sustainability of these livestock agroforestry systems so that in most area of Sardinia the stocking rate should be reduced.

## LOW FREQUENCY ELECTROMAGNETIC FIELDS: RISK ASSESSMENT IN AN OLIVE MILL

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Key words: electromagnetic fields, olive mill, risk assessment, worker's health.

The risk associated with the presence of low frequency electromagnetic fields (0 ÷ 10 kHz) is essentially related to the presence of alternate current powered systems and equipment that generates time-varying electrical and magnetic fields. These fields produce, in the human body, potentially dangerous effects which could be evaluated by means of electrical quantities such as electric field magnitude and the internal current density or, more simply, by means of easier to measure quantities such as the effective values of the electrical and magnetic fields present in the environment.

In the olive oil sector, with particular reference to olive mill operations, the extremely low frequency ELF electromagnetic fields (30 ÷ 300 Hz) mainly due to the presence of electrical distribution lines and electric motors operating at a frequency of 50 Hz are particularly relevant. An experimental analysis aimed at measuring electromagnetic fields in the productive areas of an olive mill recently built in the Bari district was accomplished. The analysis' main goal was to assess the workers' health risk level due to the presence of ELF electromagnetic fields with reference to a specific type of processing plants, widely spread in the Apulia region. A first analysis of the spatial layout of the electric machine was carried out, referring to their duty cycles and to workers' tasks (taking into particular account the working places). This preliminary analysis identified the 12 most significant points in which the measurements of effective value of the electrical and magnetic field would have been carried out. These points are essentially located near the electric motors which drive each operating machine. At these points, for the duration of a full work shift, measurements according to the CEI 211-6 standard instructions for near-field region were carried out, recording both components of electrical and magnetic fields. The low frequency electric and magnetic fields measurement system used was made by a PMM mod. EHP-50C analyser which complies both to Italian 10/09/98 D.M. 381 and to Italian 07/08/03 DPCM positioned on a non-magnetic tripod. The electric and magnetic field in the frequency range 5÷100 Hz, with a 0.25 Hz scanning interval, for the three components of a global orthogonal Cartesian reference system has been measured in each of the testing points. Effective values of the electric field ( $E_{RMS}$ ) as well as effective values of the magnetic induction field ( $B_{RMS}$ ) measured in each testing point, obtained whilst taking into account the components along the axes and the whole 5÷100 Hz frequency range examined, were both significantly lower than the limit values required by law. Peak values of both the electric field ( $E_{peak}$ ) and the magnetic induction field ( $B_{peak}$ ) measured in the different testing points at the frequency of 50Hz, were lower than the corresponding effective values  $E_{RMS}$  and  $B_{RMS}$ . The results of the tests carried out, although within the limits of a preliminary study, highlight that, inside the analysed olive mill, in the period of its maximum productivity, risks for the workers' health related to their exposure to low frequency electric and magnetic fields are not relevant.