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## VII CONGRESS OF THE EUROPEAN SOCIETY FOR AGRONOMY

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Cover paint: *Wenceslaus, "August", from the "Cycle of the Months" frescoes, painted around 1400 in the Eagle Tower of the Castle of Buonconsiglio, Trento, Italy.*

# AUTOMATIC DETECTION OF RESIDUE COVER FRACTION IN CONSERVATION AGRICULTURE SYSTEMS

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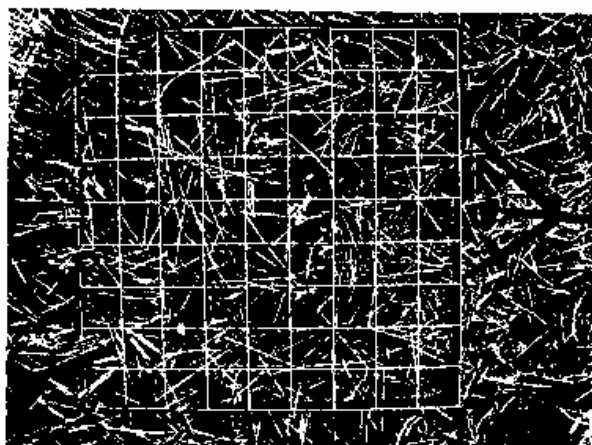
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## Introduction

The increased concern caused by the high soil loss rates occurred in the andalusian countryside, is forcing the farmers to adopt new agricultural techniques, like the tillage reduction in extensive systems, (e. g. Perea , 2000). In order to assess the efficiency of the alternative systems as a soil conservation method the degree of surface cover needs to be evaluated the purpose of this work is the comparison of the evolution of the residue cover of the soil surface under different tillage systems using several methods, from the mechanical, conventional ones to th newest image based methods.

## Materials and methods

The surface residue may be measured by either deterring the surface mass density or the fraction of any protection of the surface covered by the strubble and weeds. Many of the current methods to assess the fraction of surface cover are based on the line transect estimation (Morrison et al 1998). In this method, the fraction of intersections where a piece of strubble or a weed is found over the whole number gives an estimate of the fraction, as suggested earlier by Buffon. This method (1) is compared with the following: (2) subjective estimation of zonal occupation of strubble and weeds; (3) image-analysis of shots taken in the field; and (4) cover true contrast method in previous images.



The subjective estimation (2) determines the cover in small square units of 9 cm, within a larger square of 95x95 cm<sup>2</sup> . The value given to any square range between 0 bare soil, and 10m, full cover. The image analysis method (3) explores the field acquired images delineating the internal boundaries with the canny method.

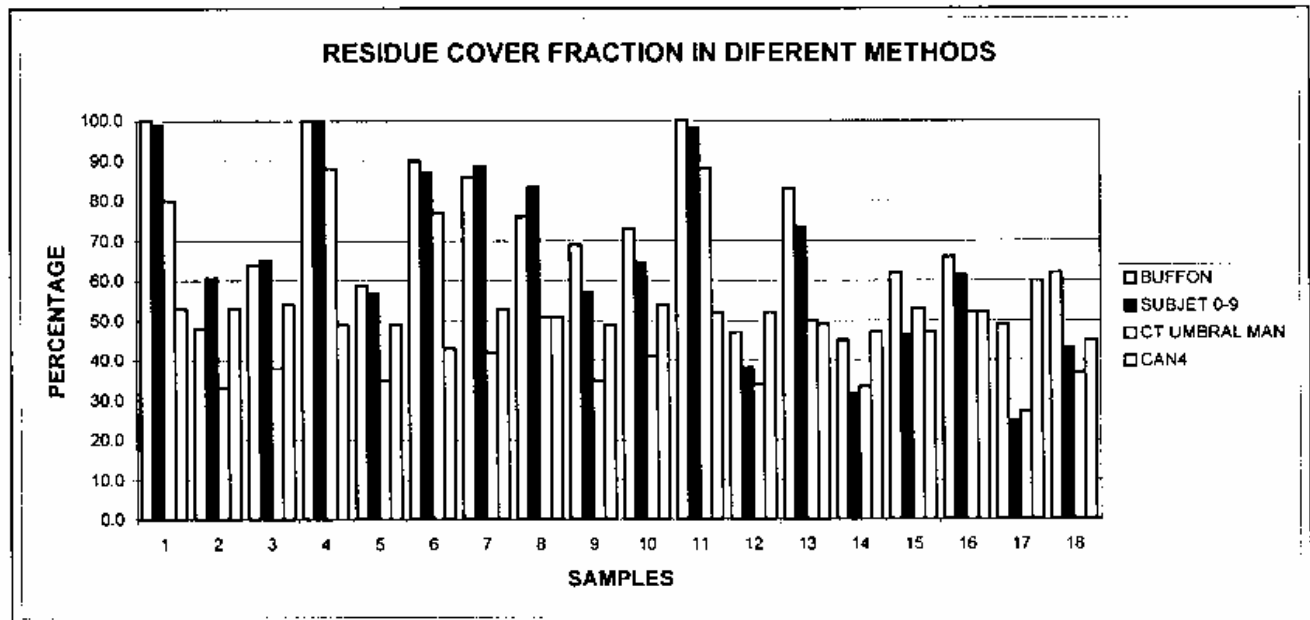
After it defines a histogram of the boundary pixels with the maximum value is the threshold in a grey colour scale between 0 and 255. Segmented image is evaluated in this way estimating the ratio of lighter pixels to the total amount.

The cover true method is a contrast technique (Corak S.J. 1995). Every single image is analysed combining methods by texture, histogram treatment and threshold setting in the colour range of sharper contrast, usually in the red region. This method allows a more accurate estimate of the cover fraction.

The images were captured in the field with a digital camera, with 3.3 Mpix of maximum resolution, enough for the resolution used in this work 1200x900 pixels. The camera was located in a metallic frame used as a mechanical support and a reference setting, with the help of an iron grid of 50x50 cm<sup>2</sup>, where several grids may be placed.

## Results

The results of 18 samples are shown in fig n° 2. Buffon and subjective estimates were larger than the other two methods. Therefore these methods in spite of their simplicity should be corrected to yield more reliable.



## Conclusions

It is convenient to adopt a more accurate method to assess surface cover fraction in conservation tillage systems. Even though image analysis and cover true methods are harder to install. The simple procedure in field and laboratory and the reliability of the results favour their adoption for residue cover studies.

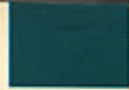
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