

See discussions, stats, and author profiles for this publication at: <https://www.researchgate.net/publication/265905548>

# Elasto-Plastic Behaviour of Soil Aggregates and the Soil Matrix as a Function of Physical Properties in three Soils of Central Chile

Chapter · October 2013

CITATIONS

2

READS

103

3 authors:



**Ignacio Fuentes**

The University of Sydney

28 PUBLICATIONS 91 CITATIONS

[SEE PROFILE](#)



**Oscar Seguel**

University of Chile

98 PUBLICATIONS 793 CITATIONS

[SEE PROFILE](#)



**Manuel Antonio Casanova**

University of Chile

86 PUBLICATIONS 974 CITATIONS

[SEE PROFILE](#)

Some of the authors of this publication are also working on these related projects:



Soil organic carbon turnover rate predictions in the framework of global warming: an approach to determine the role of climate and geochemistry. [View project](#)



Agronomic Irrigation Management Strategies that allow Increasing Water Productivity and Sustainability of Fruit Systems in the Aridization Process. [View project](#)

# **Elasto-Plastic Behaviour of Soil Aggregates and the Soil Matrix as a Function of Physical Properties in three Soils of Central Chile**

*Ignacio Fuentes, Oscar Seguel and Manuel Casanova*

## **Abstract**

This study assessed the elasto-plastic behaviour of soil aggregates and of the soil matrix in three soils of central Chile in terms of their structural development, clay content and internal tension. Soil samples (cores and aggregates) were collected from 2 Mollisols and 1 Vertisol at untilled and conventionally tilled sites. Unconfined consolidation tests were conducted on soil cores and on aggregates equilibrated to field capacity and air-dried, in order to determine bearing capacity and tensile strength.

For the air-dried samples there was a positive and direct relationship between soil mechanical properties (tensile strength and bearing capacity) and clay content, particularly in untilled soil, because of the non-degraded structure, while at -33 kPa the relationship was reverse, at least for the aggregates. Under wet conditions, soil management became more important and under no tillage we detected higher soil stability, irrespective of organic matter content. In both wet and dry conditions, preloading affected the resistance of the samples to deformation. Overall, the elasto-plastic behaviour of soil aggregates was significantly different from that of the soil matrix and the differences increased with increasing degree of soil structural development.

**Keywords:** Tensile strength, bearing capacity, aggregates, soil physical properties.

## **Introduction**

Soil structure is defined as a three-phase material, which consists of solid mineral particles, water and air, as well as organic material. The solid mineral particles are not susceptible to compression under application of normal loads (rectangular stresses), but the soil pore volume is changed, particularly the pore size distribution and the proportion of inter-aggregate pores with the largest diameter (Hallett et al., 2000). Thus, the properties of bulk soil (undisturbed and disturbed samples) are studied more frequently than individual aggregates, although the latter do not have the same porosity as the matrix, in terms of e.g.

---

ISBN 978-3-923381-58-6, US ISBN 1-59326-263-9  
© 2013 CATENA VERLAG, 35447 Reiskirchen, Germany  
peer reviewed paper