



Toward a complex system of soil: a synthetic and analytic complementary approach

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A synthetic and analytic focus of agricultural production, refers to the need to complement from a quantum vision of thought, the current vision of fractionating knowledge (physical, chemical and biology of soils) with a synthetic vision of soil dynamics that enables the sustainable management of natural resources and their harmonic production (Zúñiga, 2001).

One of the underlying conceptual aspects of agricultural production is its mechanistic vision of nature, based on the reductionism, according to which all the properties of a system can be explained through the analysis of their components: chemical, physical, biological and phytosanitary analysis. However, it is also necessary a holistic or synthetic focus with emphasis on the all. This means there is a need to consider the complementarity between the analytic vision and the synthetic vision (Zúñiga et al, 2001).

From this point of view, soil should be perceived as a complex system where different phases are complemented. An approach to this complex nature of soils can be made from the quantum mechanics' principle of complementarity which allows us to reflect on a new paradigm to interpret and build a new theoretical framework of soil sciences. According to Bohr, two concepts are complementary if they are mutually exclusive but both necessary to exhaust all the information, for example, the concepts of wave and particle, are complementary with respect to the electron. Sometimes the electron behaves as a wave that transports energy and others like a particle or matter in vibration.

Following the complementarity point of view is necessary to deepen on the relation among the traditionally measured variables that offer information about the state of the matter on the soil (matter) and those that offer information about their energy state such as thermal conductivity (European patent #. 20030228. Zúñiga, O.; Reyes, A. and Universidad del Valle, 2007) and electric resistivity (European patent # 9600407. Zúñiga, O and Gascó, J. M., 1999).

This synthetic and analytic methodology called Soil Productive Potential (SPP) or Soil Energetic Reserve (SER) allows building a soil quality indicator that includes soil synthetic and analytic parameters in study (Latin American Prize of Soil Science "Andres Aguilar Santelises – "In Memoriam" First Place, 2004).

From the SER indicator is possible to achieve with greater precision an inference on soil sustainability, efficiency and productivity in the medium and long term (Gómez and Romero, 2004), as well as to plan a differential fertilization of the crop in study, which reduces production costs and lowers contamination or the indiscriminate use of supplies.

ILAMA Group has carried out research aiming to develop synthetic technologies that allow quantifying the Soil Energetic Reserve, SER, and complement them with soil analytic techniques (Gómez P. and Romero G., 2004; Duarte, 2006; Zúñiga et al., 2007; Cubillos and Vargas, 2007; Zúñiga et al, 2008; Zúñiga et al, 2009 and Jimenez, 2010)