



USV 1842

„ION IONESCU DE LA BRAD”  
IASI UNIVERSITY OF LIFE SCIENCES

Scientific field: AGRONOMY

# **HABILITATION THESIS**

**Applied research in soil science**

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## A. ABSTRACT

The habilitation thesis with the title "*Applied research in the field of soil science*" is carried out based on the research carried out by the author after the award of the PhD, studies executed in the laboratories of the University of Life Sciences in Iasi and especially in the Research Institute for Agriculture and Environment - I.C.A.M., together with colleagues from the same institution, but also with collaborators from other university centers, resorts and research institutes in the country and abroad. The research results are the subject of original publications in top journals in this field, but they also constituted material for the elaboration of an Agrotechnical Treaty, made in collaboration with colleagues from five universities, or represented material for reports in various research projects, in especially in the last five years.

The thesis is divided into two parts: I – Achievements, academic, professional, and scientific, II – Evolution and career development plans and Bibliographic references attributed to the first two parts.

The content of the first part includes the most significant results obtained and published in journals, volumes of scientific events, activity reports related to research contracts, books. The research presented in detail are those carried out after obtaining the doctorate (April 23, 2010) and confirmed by the Ministry of Education, Research, Youth and Sports, based on Ministerial Order no. 4542 of 28.07.2010. This part includes:

**1. Research regarding long term impact of different tillage systems on carbon pools and soil nutrients.** This subchapter includes the results of the research carried out in the experimental fields of Ezăreni Farm, of the Department of Soil Management, after 10 years of testing various conservative tillage systems, a segment that occupies an important percent of the habilitation thesis. The carbon fractions were analyzed, this being a main indicator of soil quality and fertility, and the influence of the works on the chemical properties of the soil, analyzing the pH, the content in total N, available P, available K or extractable Zn.

**2. Research regarding the use of biochar obtained from wheat residues in metribuzin environmental pollution mitigation.** The suitability and effectiveness of biochar for environmental remediation were evaluated in different scenarios. Wheat straw produced mesoporous materials rich in carbon,

as confirmed by XRF, FTIR, SEM analyses, carried out in the laboratories of the Research Institute for Agriculture and the Environment (ICAM) - IULS. The results showed that the used biochar has interesting properties, surfaces proving to be very reactive.

**3. Selective quantification of acetochlor and s-metolachlor in maize and soybean plant residues by GC-MS technique.** Acetochlor and s-metolachlor are highly effective actives with pre-emergence application without incorporation, especially in areas where there is soil moisture. They are used to control annual monocotyledonous weeds and all perennial monocotyledonous and dicotyledonous weeds in corn and soybean crops. The developed GC-MS method was used to identify and quantify acetochlor and s-metolachlor from 50 corn and soybean samples collected from the experimental field. In corn plant residues, concentrations above the limit of quantification were obtained in 85% of the samples with an average value of 0.73 ng g<sup>-1</sup> and a maximum concentration of 0.97 ng g<sup>-1</sup>.

**4. Research regarding influence of crop rotation on yield, soil erosion and soil fertility.** The research aimed to optimize the fertilization technology, depending on the requirements of the different genotypes in the crop rotations and the physical, chemical and biological characteristics of the soil and to evaluate the effect of different doses of chemical, organic and plant residue fertilizers on the production and fertility of the soil.

**5. Research on erosion processes and methods to combat them in the Moldavian plain.** The reduction of areas with degraded soil and the arrangement of land with agroterraces to consolidate it contribute directly to the prevention of soil erosion, and the application of organic fertilizers and the organization of protective crop rotations help to preserve organic matter in the soil. In the conditions of the lands with a slope of 16% in the Moldavian Plateau, the reduction of soil losses through erosion below the "tolerable" limit of 2-3 t/ha/year is achieved only in the case of 4-year crop rotations with one or two spring crops with legumes and perennial grasses that protect the soil better.

In the 2<sup>nd</sup> chapter, Professional and academic achievements, you can find the most important scientific and publishing research results obtained after defending my PhD thesis: I published a course, 3 specialized books, I participated in the development of a Soil Management Book and a practice manual. As the first author/correspondent or co-author, I wrote 20 ISI/ ISI proceedings articles, of which 5 articles were awarded UEFISCDI. I was the director of 5 research grants and a member of 16 other projects.

In part II, the plans regarding the evolution and development of the career are presented. The development of the academic career will follow the fulfillment of the fundamental mission of the Iasi University of Life Sciences. Personal experience in the field of agronomy is an argument to contribute to the training of future specialists from the bachelor's, master's, and doctoral cycles to respond to the new challenges of the labor market.