

SUMMARY

of the Habilitation thesis entitled "**Research and Contributions to the Sustainable Agriculture System in the Oltenia Region**" elaborated by CS II dr. Roșculete Cătălin-Aurelian

The Habilitation thesis entitled "*Research and Contributions to the Sustainable Agriculture System in the Oltenia Region*" presents the most important findings of my professional and research activity, as well as the academic and scientific career development project. These findings are based on the work carried out after having been awarded the PhD in Agronomy, the research timeframe running from 2005 to up to present.

The structure of the Habilitation thesis is coherent, and it includes: the Introduction, presenting the current state of scientific research in the field of sustainable agriculture; scientific, professional and academic achievements, highlighting the main research directions addressed in the context of the sustainable development of agriculture; professional, scientific and academic career development; bibliographic references.

The most important scientific and professional achievements are described in relation to interdisciplinary thematic areas, and they are well documented by references to the links of the publications, being easy to check. Admittedly, they include but are not limited to: the capitalization of degraded land resulting from surface mining; the rational use of fertilizers; crop irrigation; environment protection; food quality and security.

Sustainable and efficient farming requires the development of plant cultivation strategies that ensure both food security, environmental protection and biodiversity conservation. An integrated approach is required so that productivity will be complementary to sustainability, as aspects which we have been tackled in this paper and which underpin the choice of research directions.

The current concept of *sustainable development* requires a strategy to protect the environment, while preserving the ecological balance at the global, regional and local levels.

During its development the mining industry has significantly and negatively impacted on the environment, which is why the problem of its restoration has been raised, and it continues to be a topical issue for the purpose of rendering the degraded land to the economic circuit, alongside for the purpose of effectively using the mining waste.

A solution for the development of sustainable mining in the Oltenia region could be the rehabilitation of the land at the same time with its exploitation, but before this, the operation of a new frontline is necessary for the recovery and conservation of the vegetal soil. In order to develop the affected land it is necessary to stabilize and level the tailings, both inside and outside, to improve the lands and to have a layer of vegetal soil on these surfaces. Once the rehabilitation process has been completed, the re-cultivation of the land may take place depending on the type of use intended in the future (forest recultivation, for the purpose of wood exploitation or agricultural recultivation).

In this respect, we stress the importance of using organic fertilizers of the type of compost in the formation of the layer structure at the surface of the tailings in order to retain the nutritive elements administered as chemical fertilizers and the yields obtained from some cultivated plants. Obtaining yields from crops grown on tailings depends exclusively on mineral fertilization since the intake of nutrients brought by applied organic fertilizers is insignificant.

The establishment of the plant nutrition regime is a basic criterion in terms of the assessment of fertilizer doses, which ensures the optimal nutrition, growth and development of cultivated plants, leading to the rational use of fertilizers in the context of sustainable agriculture.

In crop technologies, fertilization contributes by 30-50% to the production increase, being closely correlated with the type of soil on which crop is set up and the types and doses of the fertilizer used.

The rational use of mineral fertilizers is one of the important assets in agriculture, and the range and doses used depend on a number of factors such as: pedo-climatic, technological and socio-economic ones, featuring each country or region.

In the long-term experiments carried out in the Oltenia region, the use of nitrogen- and phosphorus-based fertilizers for a number of years (34-48) has allowed for establishing maximum economic doses.

The fertilization of crops in irrigation systems plays a particularly important role as the nutrients from fertilizers are used in a proportion of 60-70% compared to non-irrigated areas where they are used in a proportion of 30-50%.

Improving the water regime of the soil by means of irrigation allows water to be used for crops in a controlled way, making agriculture an efficient and sustainable activity.

Oltenia represents an important agricultural area in our country, characterized by agroecological potential and heterogeneous production. From the climatic point of view, the area experiences a dry season and lack of humidity during the calendar year, which coincide in terms of magnitude with the maximum requirements of cultivated agricultural plants.

In this context, I investigated the effects of irrigation on the yield of the main agricultural crops, and the correlation between irrigation, the fertilizers used and fertilizer management period.

In the complex food product chain, a number of factors (agricultural crops, processing, transport, ensuring traceability of the product to the consumer) are involved, accounting for qualitative and safe products. According to the European Union and the World Health Organization, food safety is everyone's responsibility, from its origins to the moment food is on the table.

A strategic priority for farmers is to ensure that their products - be they of plant or animal origin - are safe. Today, farmers can benefit from agricultural advice, regarding the correct use of fertilizers, pesticides and other products of this kind.

In the use of pesticides and fertilizers, it is mandatory to comply with dosing established according to the tests carried out for their approval and the timeframe, otherwise the risks of environmental pollution and their accumulation in food are extremely high and the repercussions are difficult to estimate.

One of the most common environmental indicators of plants in relation to environmental pollution is the *Allium cepa test*, which is commonly used in pollution monitoring studies, the sensitivity to pollutants being translated by chromosomal aberrations and mitotic cycle disorders, a test that we used to check the polluting effect of herbicides and fertilizers.

The modernization of the agriculture infrastructure is an essential factor for ensuring global food security, showing differences from one area to another, depending on the level of economic development and the general concept of sustainable development and implementation of production systems.

Accordingly, balanced fertilization, ensuring the necessary macro- and micro-elements for crops, will have positive effects on the quantity and quality of the crops, environment and soil fertility.

Organic farming, as part of sustainable agriculture, is able to meet the needs of organic, healthy food, naturally produced food, lacking chemical and drug residues, food additives, hormones and ingredients produced from GMOs.

In agriculture, the importance of GMOs is associated with the features that result from the presence of new fragments in genes, which lend them a number of advantages: resistance to disease and pests, tolerance to herbicides or adaptation to stress (extreme temperatures, drought, salinity or soil acidity).

Food containing GMOs raises wider socio-cultural and ethical issues at the national and international level, and legislation in this area should take into consideration the multiple policy objectives that can sometimes be contradicted; to protect the environment and biological diversity against the irreversible effects of biotechnology, to protect crops in the field of production and consumption; to optimize the biotechnological potential of improving food supply and nutritional quality; to ensure a fair social distribution of the benefits and risks of biotechnology among farmers in global food markets.

Key words: *fertilization, sustainable agriculture, environmental protection, food security*