SUMMARY

of the doctoral thesis entitled:

THE INFLUENCE OF CULTIVATION TECHNOLOGIES APPLIED IN THE SOUTHERN AREA OF ROMANIA ON SOIL PROPERTIES AND AGRICULTURAL PRODUCTION

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As is known, the development of mechanized agricultural technologies through the use of tractors and high-performance agricultural machines, with high productivity and economic efficiency, led to the emergence, intensification and extension of physical soil degradation processes (compaction, destructuring, etc.), but also the decrease in humus content of soils and changes in soil reaction.

The determining factor of soil quality, considered also the most important source of nutrients for plants, is organic carbon, which is why the agricultural technological systems must impose through the Applied Technologies, the accumulation and conservation of organic matter and implicitly the reserve of quality humus in the soil.

At present, conservative agriculture is regarded as an integral, holistic concept of crop production, which takes into account all the components of the agricultural technological system: soil works, crop rotation, management of plant residues, fertilization, irrigation, phyto-sanitary protection and harvesting.

At the same time, the conservative agriculture excludes the plowing work with the turning of the furrow and requires that the soil surface remains covered and protected by a vegetal carpet or mulch, the practice of long-term rotation (rotation), in which the breeding species of the genera: *Lolium* sp., *Medicago* sp., *Trifolium* sp., etc. are included, combined with grain or cruciferous legumes, on the background of balanced fertilization with chemical fertilizers.

The purpose of the present doctoral thesis, with the theme" The influence of culture technologies applied in the south of Romania, on soil properties and agricultural production", consisted in conducting research in five different areas of the Romanian Plain, respectively the counties: Teleorman, Giurgiu, Călărași (pond and terrace) and Ialomița, in order to follow their impact on soil properties.

The objectives set for the achievement of the doctoral thesis are as follows:

- characterization of the physical and geographical conditions of soil formation in the five studied areas;
- identification of soil types and subtypes in each studied area and their morphological and physico-chemical characterization;
- the influence of applied agricultural technologies on the physico-chemical properties of soils;
- making soil maps for the five surveyed areas and land assessment;
- modification of the physicochemical characteristics of the identified soils, depending on the applied technology, for each area investigated;

- the influence of applied technologies on the production of the main crops in the rotation;
- economic efficiency by crop, in the period 2019-2021, for each agricultural area or company.

The doctoral thesis was structured in two sections: ***the first section of the doctoral thesis*** represents the bibliographic study, which includes three chapters.

In the first chapter, there are presented aspects regarding the evolution of agricultural technologies, with reference to advanced equipment equipped with GPS, the use of software for farmers, efficiency in reducing production costs, the development of genetic research, in order to obtain varieties and hybrids with drought resistance, phytopathogenic agents and with high productivity.

Aussi, there are presented researches both worldwide and in our country, regarding the classical or conventional system, compared to the unconventional or conservative system, both with minimal tillage (minimum tillage) and without direct tillage or sowing (no-tillage). Also in this chapter, there are presented aspects regarding the conservation of water in the soil through both systems of works.

Chapter II refers to the influence of technological works on the physical-, chemical and biological characteristics of the soil, both in our country and worldwide.

The main physical properties of the soil that can be influenced as a result of these technological works are: soil structure, total porosity, aeration, bulk density, penetration resistance, permeability, which in turn can influence the physical-mechanical characteristics of the soil (consistency, adhesiveness, plasticity, plowing resistance, etc.).

Section II of the doctoral thesis presents own researches which were structured in seven chapters.

The objectives of the research were to follow the influence of the culture technologies applied in different agricultural holdings in the Southern Area of Romania, on the physico-chemical properties of soils. The research was carried out over a period of three years (2019-2021), in four counties: Teleorman, Giurgiu, Călăraşi and Ialomiţa, where pedoclimatic conditions and agricultural technologies are different.

In Chapter III, les principaux objectifs et méthodes de recherche sont présentés, it was established the location of soil profiles, their complexity category and density, according to the methodology in force (*I.C.P.A. Bucharest*).

Two series of profiles were performed in the five areas investigated, namely: April-May 2019 and August-September 2021, the results being compared according to the Applied Technology.

Also, the map of the main types and subtypes of soils was made, from each area investigated.

In Chapter IV, was presentation the physico-geographical conditions of each investigated area are presented, which constitute at the same time the factors of formation of the investigated soils.

The Calinesti area, Teleorman county, belongs to the Burdea plain, between see and Teleorman, as a continuation of the Piedmont Pitesti Plain, with an altitude of about 100 m, drained by See, Tinoasa, Caine Creek and Teleorman.

Hodivoaia area Giurgiu county, belongs entirely to the Burnazului Plain, on the Interfluve between Vedea and Arges, on Löess substrate with ground water over 5 m.

Gradistea area Calarasi County, puddle sector, formed on account of Danube alluvium, with specific Meadow climate, where alluvial soils predominate.

Perisoru area, Calarasi County, belonging to Marculesti Plain, on a typical chernozem, with ground water at over 10 m.

Bucu area, Ialomita County, on a limestone alluvial soil, formed in the floodplain of the Ialomita river, with groundwater at 3-4 m.

In Chapter V, **"Morphological and physico-chemical characterization of soil types in the investigated areas"**, are presented in detail soil types and subtypes, their morphological and physico-chemical characterization, soil units records and their crediting. Also in this chapter, the soil maps for each cadastral territory are rendered.

In terms of land crediting, they are classified in the second class (preluvosol russata, molic from Calinesti, cernoziom cambic from Hodivoaia and typical chernozem, from Perisoru and the two areas, Gradistea and Bucu where soil types are formed on account of alluvium, are classified in the third class.

For each of these areas, graphs were made on the analyzed indicators and field crops.

In Chapter VI, "The influence of applied technologies on the physico-chemical properties of soils in studied area", the resulting changes are presented on account of the technologies applied during the three years of study.

The results obtained after performing the two series of profiles 2019 and 2021 were compared, both physical (apparent density, total porosity and degree of subsidence) and chemical (soil reaction and humus content), depending on the agrotechnical works performed.

Under the conditions of the reddish preluvosol from Călineşti, Teleorman county, it was found that the physico-chemical characteristics were modified in a favorable sense, as follows: the bulk density values up to the depth of 100 cm, decreased in 2021 compared to 2019, at each pedogenetic horizon (in the Am horizon from 1.26 g/cm^3 to 1.25 g/cm^3; in the AB horizon from 1.31 g/cm^3 to 1.28 g/cm^3; in Bt horizon from 1.46 g/cm^3 to 1.36 g/cm^3;) remarkable results were obtained in terms of humus content, as follows: in Am horizon from 3.2% to 3.3 %; in AB horizon from 2.8% to 2.9 %; in the Bt horizon from 1.7% to 1.8 %); soil reaction values decreased by 0.2 units, probably due to the application of chemical fertilizers.

In Hodivoaia, Giurgiu County, on cambic chernozem, it was found that the physical characteristics are improved throughout the depth of the soil profile: the bulk density decreased in the Am horizon from 1.27 g/cm^3 to 1.25 g/cm^3; the humus content increased considerably in the bioaccumulative horizon, from 3.39% in 2019 to 4.17% in 2021; the soil reaction decreased by 0.6 units in 2021, possibly due to the application of nitrogen fertilizers applied.

In Călăraşi County, two areas with different pedo-climatic conditions were studied: Grădiştea, in the meadow area on a calcareous alluviosol and Perişoru, in interfluvium on typical chernozem, vermic. In both areas, a superior technology is practiced, with the observance of rotation and on certain soles under irrigation conditions.

In Bucu, Ialomiţa county, under less favorable conditions, on a limestone alluvial formed in the floodplain of the Ialomiţa river, with a weaker endowment and in poor climatic conditions, a less performing technology is practiced.

In Chapter VII, "The influence of applied technologies on the production obtained in each studied area", are presented the production results for wheat, corn and sunflower, in dynamics during the research period.

Under the conditions of the Călineşti preluvosol, there is an increase in production from 7000 kg/ha in 2019 to 8300 kg/ha in 2021 for wheat culture, and for corn, the yields obtained are very low, due to the lack of rainfall during the vegetation period; the culture vegetates well until the appearance of the panicle, then begins to suffer.

In sunflower, being more resistant to drought and with better developed root system, yields of over 3000 kg/ha were obtained each year of study.

In the conditions of the cambic chernozem from Hodivoaia, on account of the classical technology applied, observing the rotation and performing the agrotechnical works at the optimal time, good yields were obtained in all three crops, throughout the research period.

In Gradistea, the puddle area, on limestone alluvial soil, a modern technology is practiced, partly for irrigation, in certain periods the crops benefit from phreatic intake, the productions are medium due to the lower productive potential of the soil.

In the conditions Perișoru on the typical chernozem, a superior technology is applied, observing the crop rotation, partially irrigated, good-very good yields were obtained.

In Bucu, Ialomita County, the most disadvantaged area, on a limestone alluvial soil, poor in humus and nutrients, there is no phreatic intake, the applied technology is at a less performing level, and the obtained productions are very small. In addition to these aspects, the climatic conditions were deficient, even limiting in 2020, when the agrotechnical works to mobilize the soil were impossible to carry out.

In Chapter VIII, "Crop structure and economic efficiency, from the areas investigated", the most important aspects of the five areas investigated are presented, regarding the weight of each crop in the rotation, the productions obtained, the related expenses and the profit obtained.

As is known, the subsidy granted per hectare is EUR 170, which was not taken into account when determining the profit obtained.

In the situation in Călineşti, Teleorman County, straw cereals occupy almost 50% of the crop structure, followed by rapeseed, sunflower and corn.

The largest profit was obtained in sunflower, followed by barley, rapeseed and wheat. For corn, the expenses exceeded the revenues, so the profit was negative except for 2020, when a profit of 300 lei/ha was obtained.

In Hodivoaia, the share of cultivated areas is represented by the two basic crops, wheat and maize, followed by sunflower, occasionally peas.

The yields obtained are very good and constant in all crops during the three years of research, for which a substantial profit was obtained with minimal expenses.

In Grădiștea, the crop structure is more diversified because the company also owns a livestock farm, the share of crops being represented by corn grains and silage, straw grains, followed by soybeans, mostly the land being irrigated.

The productions obtained were good in 2019 and 2021, except for 2020 when the productions were very low due to drought. The phreatic level was very low (below 4-5 m), so the phreatic intake was not manifested, and the irrigation systems were insufficient.

In Perișoru, the crop structure is balanced and represented by straw, corn grains, sunflower and soybeans including experiment sola (medicago sp.), mostly irrigated.

The yields obtained were good and constant throughout the research period, except for 2020, an atypical year for agriculture due to drought, but here with the help of irrigation systems, the crops also ensured profit every year.

At Bucu, the crop structure is represented by straw cereals, corn, sunflower and alfalfa. Crop rotation is easily adapted due to local conditions (moisture deficiency, low fertility soil, wild boar invasion, etc.), corn is replaced by sunflower or rapeseed.

The obtained productions were small throughout the research period, with very low profit, except for 2021, when the productions were average for all crops, except for sunflower, where the profit was negative.

Also, in 2020, the driest year in recent years, including the research period (2019-2021), the profit obtained was negative.

The chapter IX, "General conclusions and recommendations" summarizes the studies carried out in each pedoclimatic zone, depending on the applied technology, the potential of the soil and the equipment with agricultural equipment under irrigated or non-irrigated conditions.