SUMMARY

As a result of the alarming increase in the world population and climate change in the recent years, the food security and the environment are jeopardized, so it is necessary to increase the volume of research in agricultural recovery and playback circuit of many areas of arable land in order to increase production without environmental degradation through excessive intensification of the agricultural processes.

This is the main motivation for which I developed the thesis entitled "Sustainable technologies of plant crop adapted to local pedological and climatic conditions by using some synthetic macromolecular compounds", in which we proposed the finding, development and implementation of technologies for growing in less productive areas. In the context of global climate change, the introduction in the crop technology of some synthetic macromolecular compounds is one of the most approved methods of increasing productivity of agricultural land, with wide applications in modern agriculture and by the use of synthetic macromolecular compounds may be reused different farming lands exposed to surface erosion, drought or other forms of degradation.

This paper aims to provide new data on land productivity through the development, testing and implementation of sustainable technologies for growing plants adapted to local climatic features by using synthetic macromolecular compounds and is also aims at reducing the gap to average productivity of agricultural land in the EU, and as the specific objective to improve the technologies and to establish implementing rules according to local pedoclimatic features and cultivated plant species was followed.

Achieving these objectives involves fulfilling certain objectives associated, such as:

- ✓ Establishing the Aquasorb influence on some hydro and physical properties of soil;
- ✓ Establishing the influence of some tested macromolecular compounds on soil biological activity;
- ✓ Establishing the influence of the macromolecular compounds tested on morpho-physiological traits of the plants;

✓ Establishing the influence of the macromolecular compounds tested on yield and productivity elements of crops analyzed.

To achieve the above objectives we conducted the following activities:

➢ Implementing experiences with rules compliance in experimental techniques for the design, organization and execution of field experiences. Picketing and placement of the experiences was made with respect to the methodology of experimental technique.

➢ The experiments were organized in respect to all the requirements imposed by the crop technology, for both land preparation in agrotechnical terms (execution of basic works, seedbed preparation, weed control and execution of maintenance works during the growing season at optimal ages and with suitable mechanical means, properly fitted and adjusted) and in phytotechnical terms of plant growing by following the seeding, maintenance and harvesting.

➢ Also, to achieve the objectives were used plant varieties adapted to local pedoclimatic features (PR38A24 in maize PR91M10 in soybean, both from Pioneer).

➢ Soil sampling to determine and highlight the different physical and hydrophysical properties of the soil, such as bulk density, moisture, soil water reserve. These activities were conducted separately, on each variant of each repetitions, in order to more accurately illustrate the differences which occurred between the differentiated treatments of analyzed variants.

➢ Soil samples were taken in order to determine the activity of soil microorganisms, differentiated for each version of each crop.

➢ Soil samplings for determinations related to soil chemistry were made 0-40 cm depth. Through this activity were determined soil pH, humus content, total nitrogen content, $N\text{-}NO_3$ and $N\text{-}NH_4$, the soil content in mobile phosphorus and potassium and the determination of total cation exchange capacity.

The experiments were located in the Didactic Station, University of Agricultural Sciences and Veterinary Medicine "Ion Ionescu de la Brad" University, Ezăreni farm, on a field with the following characteristics: the slope of 3-4 %, cambic chernozem soil type, loamy -clay, formed by loess deposits with a fertility medium to good (middle supplied in N and P_2O_5 and good supplied in K_2O) weak acid soil pH, humus content of about 2.5 to 3.0 %.

The thesis is divided into ten chapters, contains 250 pages, 102 tables and 59 figures and graphs. The first part, consisting in two chapters, is a synthesis of literature on the subject of the thesis. In the second part, divided into eigth chapters, we characterized the soil and climate, we described the methods and material of research and we interpreted the research results.

Chapter I presents a summary of the current state of research on the use of polyacrylamide and humic substances in agriculture. Some issues regarding the polyacrylamide effects on the environment, its degradation in soil and water, polyacrylamide influence on soil erosion, its physical and chemical properties and its effects on soil microbiology are presented.

Humic substances are analyzed in terms of composition and structure, physical and chemical properties, biological degradation and their use in agriculture.

In chapter two are presented in summary the most important aspects related to the physical and chemical properties and forms of water, and the most important indicators related to water movement in the soil, soil water content and water requirements of the plants analyzed.

In the third chapter is presented the natural environment where the research took place, both in terms of general climatic conditions, vegetation and soil, and the climatic conditions prevailing in the three years of experience. An overview of these conditions showed that 2010 and 2011 were relatively favorable years for the analyzed crops, while 2012 was characterized by the uneven distribution of total rainfall, this thing corroborated with the registration of monthly average temperatures over the annual average for the area resulting in the onset of drought, especially in the summer months, this resulting in compromised yields for the analyzed crops. Scientifically, the climatic conditions of 2012 have shown the limits of macromolecular compounds that were analyzed.

The fourth chapter of the thesis are presented the goals, the objectives, the materials and the research methods. To determine soil bulk density and total porosity there were collected soil samples in the setting from 0-30 cm depth, with divisions from 10 to 10 cm, followed by the determination of soil bulk density by dividing the mass of dry soil in the oven at total sample volume and the total soil porosity using the relationship proposed by *Rusu T. et. al., 2007, Canarache A., 1990* ($PT = (1 - Da/D) \times 100$). Soil moisture was determined on 0-30 cm depth with subdivisions from 5 to 5 cm, using the gravimetric method. Soil water reserve was determined indirectly using the formula proposed by *Dumitru Elisabeta et al., 2009* ($X_s = W_g \times DA \times h \times 0{,}1$). Morphophysiological determinations of plants were made in the experience fields, using the CCM 200 plus device from the Opti-Science company to determine the chlorophyll content of the leaves and tapes to determine the average height of plant in different development phenophases. The yield and productivity elements were determined at the end of each crop year, these being performed by using the analysis of variance and F test. The analyzes on soil microflora were performed by using the method of cultures in Petri plates.

In chapter five are presented and interpreted the results regarding the influence of Aquasorb on some physical and hydrophysical properties of soil. Statistical analysis of mean values by years and 0-30 cm depth showed that treatment with polymer positively influenced soil bulk density, its total porosity, soil moisture and total water reserve, both for the maize and soybean crop, the recommended dose being 15 kg/ha Aquasorb.

In chapter six are presented and interpreted the results regarding the influence of some synthetic macromolecular compounds on soil biological activity. The analyzes performed showed a much higher number of bacteria in the soil at the expense of micromycetes and this is

mainly due to the competition between them for some substances, bacteria being better adapted than micromycetes, for both Aquasorb and Lignohumat experiences. In both cultures, the number of bacteria G^- was growing at the expense of G^+ bacteria.

Soil biological activity was mainly influenced by the presence of Aquasorb in the soil and less by the dose, age and how it was incorporated into the soil, between the variants treated with 15 kg/ha Aquasorb and the variants treated with 30 kg/ha, relatively small differences being recorded, regardless of the age at which the polymer was given. The Lignohumat determined the increase in the number of G^- bacteria and micromycetes at the expense of G^+ bacteria, in the soybean crop the micromycetes number raising more obviously than in the case of maize crop (from 3.4 % to 3.7 % for maize crop and from 3.1 % to 5.9 % for soybean crop).

In the seventh chapter are presented and interpreted the results regarding the influence of some synthetic macromolecular compounds on some morpho-physiological properties of plants for maize and soybean crops.

Aquasorb treatment positively influenced the number of grains/cob, the number of beans/plant, the average plant height and leaf chlorophyll content both for maize and soybean crops. The average number of plants per hectare was significantly influenced only in the variants treated with 30 kg/ha Aquasorb, while in variants treated with 15 kg/ha Aquasorb there were recorded differences uninsured statistically compared to the control.

Lignohumat treatments positively influenced the analyzed parameters in close interdependence with the climatic conditions of the analyzed period. Thus, it was observed that the less favorable climatic conditions of 2012 the Lignohumat positive effects could not be valued by the plants.

In chapter eight are presented and interpreted the results regarding the influence of some synthetic macromolecular compounds on yield and productivity elements. Statistical analysis showed a positive influence of Aquasorb and Lignohumat treatment on MMB and yield for both analyzed crops. The positive effects of macromolecular compounds used were valued by the plants in close interdependence with the climatic conditions, particularly the rainfall uniform distribution. This was particularly obvious for the MMB in soybean crop due to the lack of rainfall in the summer of 2012 during the grain filling. Hectoliter mass was influenced only by climatic conditions and less by the treatments performed, in both cultures the differences between the treated versions and the control variant being uninsured statistically.

The ninth chapter refers to economic efficiency of macromolecular compounds Lignohumat and Aquasorb, used in field crops. The results showed the direct influence of these compounds on economic efficiency in maize and soybean crops. The most efficient is to use 15 kg/ha Aquasorb and 100 g Lignohumate / 10 l water / t seeds + 60 g / ha / 300 l water in 3-4

leaves stage of maize and 100 g/10 l water / t seeds + three applications of 60 g / ha / 300 l water in 3 leaves, before and after flowering of soybean.

At the end of the thesis, in chapter ten, the general conclusions are presented, followed by the references.