"Dunărea de Jos" University of Galați

Doctoral School of Fundamental Sciences and Engineering

THESIS

RESEARCH ON OPTIMIZING THE PRODUCTION OF HYBRID MAIZE SEEDS IN AGRICULTURAL HOLDINGS IN THE BĂRĂGAN PLAIN

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Thank you!
Cristina DINCĂ

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INTRODUCTION

Cereal cultivation plays a particularly important role both in human nutrition and in the economy, with plants grown on more than half of the planet's arable land, being an important food source in the food of the population and animals and the basis of industrial raw materials for milling and bakery, manufacture of starch and alcohol, pharmaceutical or biofuel production.

Along with wheat and rice, corn is one of the most cultivated plants in the world, due to its large production capacity, as well as due to its varied use in animal feed and in many other areas of human activity. The high yields of grains or green mass, together with a great diversity of possibilities to exploit it, through various processing methods, have determined that this crop is among the most important components of modern agriculture, intensive and implicitly, of the programs of economic and social development.

Although it does not have a high productivity, Romania is among the top ten most important grain exporting countries in the world, due to its agricultural area.

At the national level, corn is the second most important crop, its cultivation being influenced by meteorological factors and rainfall. Achieving production that ensures financial comfort for producers must be done by optimizing all the factors that contribute to the development of the plant without forcing high yields through excessive application of fertilizers and other growth stimulants that create imbalances both in the plant and in environment.

In the next period, the challenge for farmers is to find solutions to increase yields per hectare without endangering the soil and the environment. In this sense, the use of quality certified seeds with high production genetic potential is the essential element for a modern agriculture. Thus, the seed production process has become an extremely important element for agriculture, which aims to obtain seeds with high biological, cultural and phytosanitary value and maintain the typicality of the hybrid or variety throughout the cultivation period, as described in the approval. .

The main objective of seed production is to maintain the biological characteristics of varieties and hybrids at the initial level, which made that variety or hybrid to be recommended for production. This activity is carried out according to special norms and techniques, according to technologies developed by the research stations that produce the parental forms and is made by economic agents authorized and certified by the Ministry of Agriculture and Rural Development through county LCCSMS and ITCSMS.

The production of hybrid maize seeds on specialized farms and on large areas is essential for the agricultural sector, to ensure the need for seeds with high biological value, given that obtaining hybrid maize seed is a complex technological process and must be produced annually. This process is achieved by applying a complex of technological works specific to seed production such as: choosing the land on which seed crops will be established, ensuring the isolation space and crop rotation, basic and facial fertilization of the crop, sowing depth and ensuring the ratio between the parental forms according to the research recommendations, the performance in the optimal period of the technological works, the timely execution of the biological purification works, the castration of the maize batches at the optimal moment so that the varietal purity falls within the values each crop without depreciating the germination capacity, their storage and processing under appropriate conditions.

The purpose and structure of the doctoral thesis

The aim of the research paper is to identify the best parental forms of maize hybrids with the greatest adaptability to soil and climatic conditions in the area analyzed, obtaining the best yields on the three sites established, so that the results obtained help farmers in those areas in making cultivation decisions that allow them to produce maize hybridization batches, in optimal conditions of technology and production.

This research corresponds to the model of sustainable smart agriculture, characterized by the following aspects: ensuring market demand by optimizing product quantities; ensuring the quality of marketed products and maximizing economic profitability by achieving maximum economic efficiency in competitive conditions. Being a component of the cultivation technology, the high quality seed obtained is a natural technological element to increase production without affecting the soil and the environment.

The main objective of the research was to conduct an experimental study on the opportunity for farmers in Brăila County to establish the optimal production structure that would allow them to decide to produce maize hybridization lots, so that the farm obtains maximum profit, based on specific indicators of technology and productivity.

To carry out the doctoral thesis, the research was conducted during the years 2017-2019, both in laboratory and field conditions, using established experimental and statistical research methods. Under the specific laboratory conditions, a complex preliminary study was performed on the influence of two experimental factors, genotype and soil from Vădeni, Unirea and Bărăganu locations, on germination and cold-test, for 20 parental forms of hybrid corn.

The field research was carried out for two years (2018 and 2019), on agricultural areas provided by companies located in the three areas, in the county of Brăila, Vădeni, Unirea and Bărăganu, located on soils, alluvial with a clay-loam texture, typical chernozem and coarsely textured chernozem.

The studies focused on the interaction of 10 batches of maize hybridization with the main crop factors that influence the degree of pollination of the cob (NMS), the average weight of the cob (GMS) and the average production (PM) achieved. The obtained seeds were analyzed in the laboratory determining the following parameters: humidity (U%), germination (G%), mass of 1000 grains (MMB) and cold-test (CT), studying the influence of culture factors on the main indices quality and establishing the best genotypes for the analyzed areas.

This study was considered a necessity for farmers in these areas, given that climate change is increasing and the capitalization of the genetic potential of parental maize lines at the optimized value is a main objective for each farm.

The thesis is structured in five main chapters, supplemented by final conclusions, bibliography and annexes, the list of published works, awards and other recognitions of the value of research conducted during the thesis. For a good reading and understanding, lists of abbreviations used in the text, tables and figures were made.

CHAPTER 1 entitled "Importance, origin, distribution and current market of maize consumption", carried out theoretical documentation by analyzing the importance, origin, spread and current market of maize consumption, for this purpose, making an assessment of

the importance of maize cultivation, the evolution and the current situation of maize cultivation in Europe and in Romania, highlighting the natural framework for conducting research.

CHAPTER 2, entitled "Seed and its importance in agriculture", dealt with the importance of certified seed for agriculture, the international context on the seed market, regulations and rules on the production of certified seed, the current dynamics of domestic seed production, the production of hybrid seed maize.

In CHAPTER 3 entitled "Design of the experimental study and analysis of soil and climatic factors" were presented the research objectives and procedural aspects of conducting research, analysis of climatic conditions in 2017-2019 and a SWOT analysis of the factors that determined the concentration of hybridization lots in Brăila county.

CHAPTER 4 called “experimental results” makes a description of the laboratory work methodology and the interpretation of the results of the performed analyzes, the comparative analysis of the field culture technologies, the field experimental methodology and the determination of the quality indices at the obtained seed.

CHAPTER 5 entitled “Statistical analysis necessary to evaluate the individual and group yields of hybrids to achieve research objectives” dealt with working hypotheses, dissemination of general and individual statistical results, statistical modeling of results and demonstration of working hypotheses.

The paper cites a number of 136 bibliographic sources, extends over a number of 220 pages and includes 27 tables and 167 figures, made by the author, by processing bibliographic information, processing and interpreting research results obtained during the experiment.

CHAPTER 1. SIGNIFICANCE, ORIGIN, SPREAD AND CURRENT CONSUMPTION MARKET OF MAIZE

Global maize production exceeds any other cereal crop in the world each year. 850 million tonnes of maize are produced on an area of 162 million hectares, which represents an average yield of 5.2 tonnes / hectare [10]. Research in the field of corn genetics has allowed not only the creation of hybrids with productive capacity and very good quality, but also with genetic resistance to pest attack, Ostrinia, Diabrotica and various pathogens [8]. For the increase of the production potential, of the quality as well as of the tolerance and resistance to the attack of diseases and pests an important role plays a proper zoning and microzoning of the maize culture, of the hybrids as well as the cultivation technologies [9].

According to FAO data [11], the continents where the largest areas of maize are grown are America, Asia, Europe and Africa. The share of maize production at global level, by continents, is presented in figure no.1.1.

Globally, the largest producer of maize is America with a share of over 50% of world maize production, followed by Asia with over 30% of total maize production and Europe which ranks third with a share of maize production. over 11% of total world maize production [11].

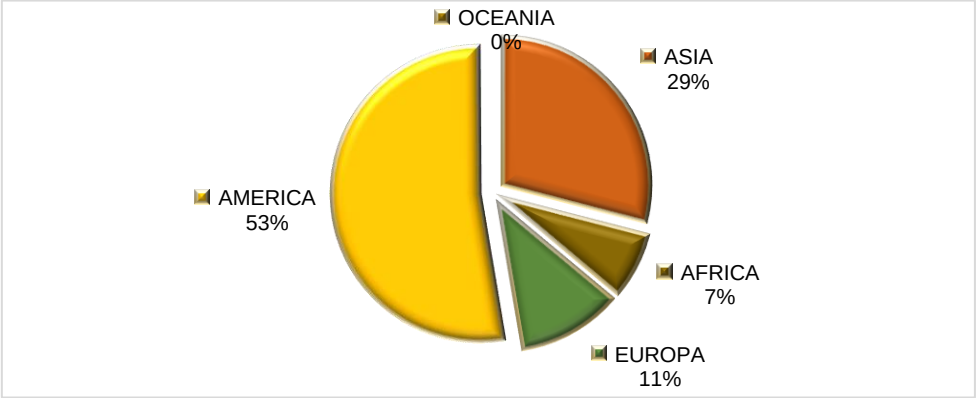

Figure no. 1.1. Share of world maize production 1994-2018 [11]

In the national agriculture, the corn culture is spread all over the country, occupying the first place at national level, surpassing the wheat crop. According to FAOSTAT data, Romania has the largest area cultivated with corn in Europe, being among the top 10 countries exporting corn globally (figure no. 1.3).

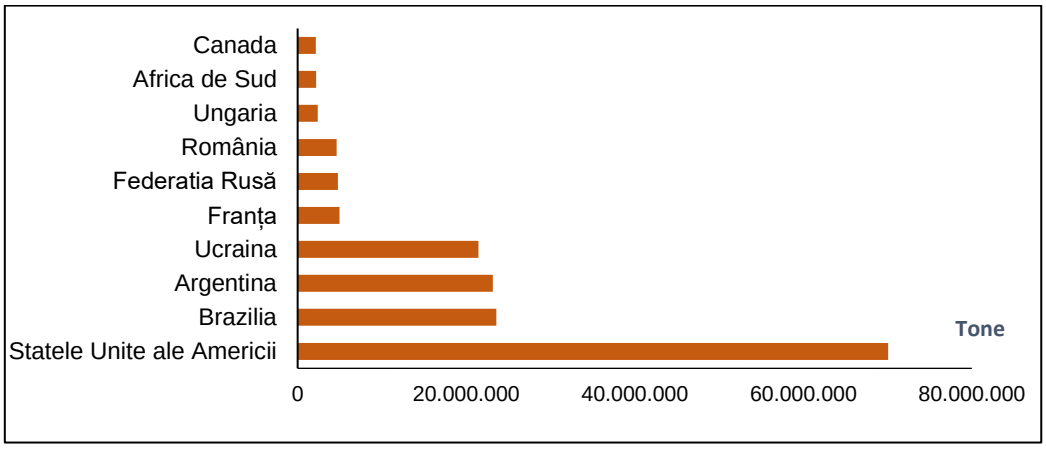

Figure no. 1.3. Top 10 Corn Exporting Countries Worldwide in 2018 [21]

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In Romania, on 76% of the surface of the agricultural territory, the thermal factor is favorable and very favorable to the corn crop, it can ensure the obtaining of high harvests. Favorable areas for maize cultivation are grouped according to the sum of biologically active temperatures (TBA sum), which exceed the limit of 10o C, in six favorability regions [26].

In order to make the most of the area's potential for maize cultivation, special attention must be paid to the choice of maize hybrids according to the earliness and individual requirements of the climate and soil conditions [2].

Natural framework for conducting scientific and technical research (South-East Romania) Brăila County is located in the South-East region of Romania, in Muntenia and is part of the Romanian Plain, with an area of 4,765.8 km², which represents about 2% of the entire country [34] and is part of the climate zone continental, in the plain climate, in contact with the specific climate of the Danube Meadow. The Danube River and the rivers Siretul, Buzăul and Călmățui, are the main flowing waters on the territory of the county that have an important role in determining the relief on its entire territory [36].

Summers are generally hot and dry due to continental air masses under the influence of high values of solar radiation, and winters are frosty, marked by strong blizzards with unstable and shallow snow cover [39].

Because the relief is mostly slightly modified throughout the county, the main climatic characteristics are similar throughout it [36].

The air temperature regime through the monthly average values and especially through the absolute amplitude, most clearly reflects the characteristics of the continental temperate climate, with excessive shades [39]. The lowest average multiannual monthly temperatures are achieved in January, the coldest month, when the air is recorded at -3 ºC (-2,1 ºC Brăila).

The average annual temperature recorded at the meteorological station in Brăila has increased in recent years, from 11.6 ºC in 2017 to 12,9 ºC in 2019 (figure no.1.16).

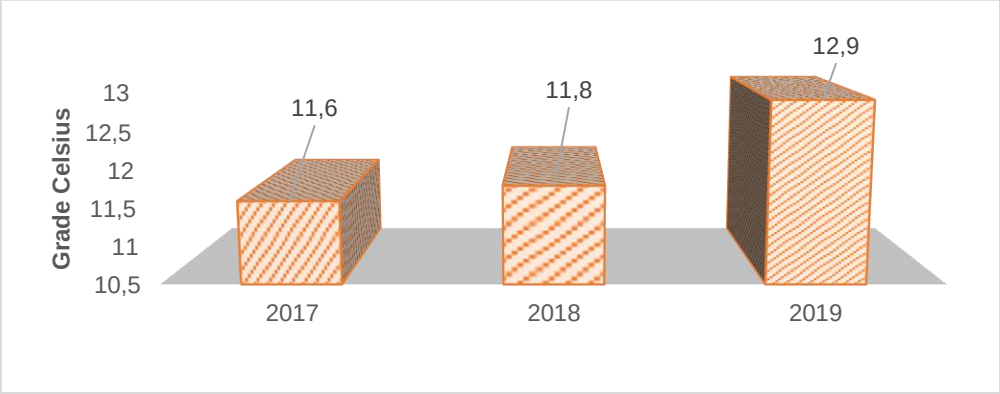

Figure no. 1.16 Annual average temperatures recorded at Brăila (Annex 1)

The southern and southeastern part of Romania is the most vulnerable to the phenomenon of extreme agricultural drought, especially the areas: Dobrogea, Bărăgan, southern Oltenia, Muntenia and Moldova, where the problem of drought resistance is one of the current problems of national agriculture, with all the more so as the frequency of drought years and damage to crops due to drought will increase with global climate change [42]. In the last three years, according to data taken from the Meteorological Administration, at Brăila station there is a decrease in annual rainfall, their average having a negative evolution from 556.6 l / sqm in 2017 to only 341.1 l / sqm in 2019 (figure no.1.18).

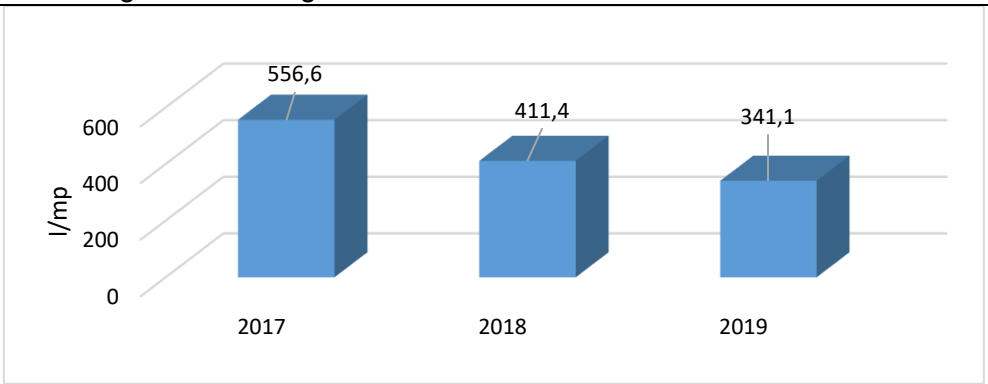

Figure no.1.18 Total amount of precipitation recorded at Brăila station in the years 2017-2019 (Annex 1)

The technological process of agricultural production is based on the knowledge of natural conditions, the soil being the main means of production.

Soil quality is the result of the interaction of natural factors such as climate, vegetation, relief, weather, but also of anthropogenic factors [49]. The soil types characteristic of Brăila county are presented in table 1.2.

Table no. 1.2. Soil types characteristic of Brăila county [39]

Tipuri de sol	Suprafața (ha)	Procentual (%)
Protisoluri	135.686,75	34,65
Cernisoluri	203.552,00	51,98
Hidrisoluri	36.477,00	9,31
Salsodisoluri	15.863,00	4,05
Antrisoluri	-	-
TOTAL JUDEȚ BRĂILA	**391.578,75**	**100**

In Brăila county, the predominant soils are chernozems formed in the conditions of semi-arid climate on loessoid deposits, on alluvium and sands under steppe vegetation that have a high degree of porosity allowing the vertical infiltration of water [50]. Land quality refers both to soil fertility and to the manifestation of plants to other environmental factors, such as atmospheric, light, heat, precipitation, continuing with the geomorphological and hydrological. From this point of view, the quality of the land is represented by the favorability, respectively the rating note for natural conditions, regarding a certain use [57]. Land reclamation is done in 5 quality classes, from class I, the best, with 81-100 rating points to class V, the lowest quality, with 1-20 rating points The productive capacity of the land is the qualitative expression of the conjugated manifestation of all vegetation factors that act independently of plants and determine the level of satisfaction of their physiological requirements, in a certain place and in a certain time interval [58] .

CHAPTER 2. SEED AND ITS IMPORTANCE IN AGRICULTURE

Investments in competitive agriculture, obtaining increased productivity and high yields can be optimized by farmers' access to high quality seeds for agricultural crops. Seed producers must be aware of the requirements and technical regulations necessary to achieve a crop intended for obtaining certified seed and ensure that all operations are carried out strictly in accordance with specific regulations and in a timely manner.

Seed is the most important natural factor for increasing production and is the natural way of transmitting plant characters from one generation to another, being considered the basis of plant life and the most important link for starting a new production cycle [26]. In the embryo, the seed has a series of valuable components that together with the characteristics of vigor, health must ensure a uniform and rapid emergence in the field that will lead to the growth of vigorous, healthy plants, capable of producing high yields.

According to Law 266/2002, seed means any material of reproduction or planting: seeds, fruits, propagating material produced by any method of multiplication, intended for multiplication or for the production of food or industrial consumption [60]. For a long time, agricultural production was based on ensuring optimal plant growth conditions, without rationalizing the consumption of raw materials. In many countries, seed production and trade are important elements in rural employment, generating important sources of income for farmers [63].

The Ministry of Agriculture and Rural Development through the Central Laboratory for Seed and Planting Quality (LCCSMS) and through the Territorial Inspectorates for Seed and Planting Quality (ITCSMS) certifies the identity of seed lots in the field and laboratory testing the quality of seeds used for sowing. and authorizing economic operators to carry out these specific activities [60].

The purpose of the control is to provide agricultural producers with seeds intended for sowing, which are appropriate in terms of quality and health status. The biological categories of seeds allowed for sowing are:

Breeder seed means seed produced by or under the direct responsibility of the breeder or maintainer, using specific selection methods, from which pre-basic seeds are obtained, which meet the requirements of the varietal purity regulations in force [61].

The seed of the pre-basic biological category is the seed that is obtained from all the links obtained by the breeder, was produced by the maintainer or under his responsibility, and complies with all the requirements established by the legislation in force provided for pre-basic seeds [60].

Basic seed means seed produced by or under the direct responsibility of the maintainer, which was produced from the pre-basic seed, is intended to obtain certified seed and meets the requirements of the legislation in force specified for basic seed.

Certified seed means, in the case of hybrids, seed produced in hybridisation batches from basic seed and intended for crop production for human, animal or industrial consumption [60]; in the case of varieties, the certified seed is produced directly from the basic seed and is used for the establishment of crops for consumption and which must comply with the requirements imposed by the legislation in force specified for certified seed. At the request of the author or maintainer it can be obtained from a pre-basic seed.

Worldwide, a number of international organizations, conventions and treaties have as their object the regulation of the seed market and propagating material, from access to seed material to the delivery of quality seeds to producers [30]. Related to this, they provide an international regulatory framework for the market for certified seeds and propagating material, in order to monitor the interests of producers and consumers [69]. European legislation applies

to plant species and species important for the internal market, with an emphasis on the registration of varieties and propagating material, respectively on the certification or inspection of seed lots and plant propagating material before marketing [74].

Compared to straw cereals, in the case of maize, the production obtained per hectare of a lot of hybridization of maize can be destined to the cultivation of much larger areas, which can reach up to 170 hectares of commercial maize.

The production of seeds in Romania is usually carried out on the basis of a multiplication contract between the seed company and farmers, being highlighted in the market the tendency of international companies to produce seeds for sale locally [81].

At national level, in order to obtain certified seeds in the last 6 years, an average of 143 thousand ha were cultivated, the agricultural areas destined for this activity being between a minimum of 129 thousand ha, registered in 2015, and a maximum of 151.4 thousand ha in 2014. (figure 2.3).

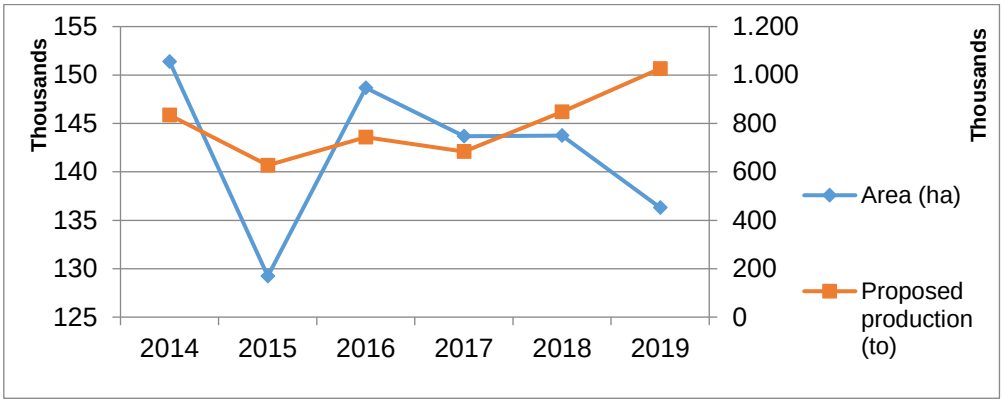

Figure no. 2.3. Evolution of areas and production of certified seeds in Romania [86]

The cultivated areas and the obtained productions differ from one region to another. At the level of 2019, Brăila county, with a total area of 19,370 ha representing approx. 14% of the total cultivated area at national level and a production of over 150 thousand tons of seeds, occupies the first position at national level, followed at a comfortable distance from Călărași, with 13 thousand ha and then Iași, Ialomița, Tulcea. Of the 41 regions analyzed, only 6 counties exceeded the limit of 80,000 ha cultivated in order to obtain seed material.

There are also important differences in average productivity per ha. Seed quality certification is a set of control and verification operations in the main phases of the multiplication, conditioning, packaging, labeling and sealing process that ensure that products, processes and services comply with specific technical rules and regulations [83].

The national top of seed-producing counties shows the existence of several regions with relatively high shares, respectively with shares higher than 5%, where the national market of certified seeds has a high degree of concentration. At the national level, corn is the second most important crop, its cultivation being influenced by meteorological factors and rainfall [91]. Achieving production that ensures financial comfort for producers must be done by optimizing all the factors that contribute to the development of the plant without forcing the production of large yields by excessive application of fertilizers and other growth stimulants that create imbalances both in the plant and in environment.

The use of quality seeds with high production genetic potential is the essential element for a modern agriculture. Ensuring certified and quality seed is a key objective for seed producers as obtaining hybrid maize seed is a complex technological process and must be produced annually [86]. The production of hybrid seeds on specialized, large-scale farms has become essential for the agricultural sector, in order to ensure the need for seeds with high biological value that will help increase production without increasing other resources [96]. In

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Romania, the hybrid corn seed is obtained by cultivating large areas with hybridization lots in specialized farms, authorized, with staff trained and certified by MADR through county ITCSMS and central LCCSMS, institutions subordinated to the National Inspection, representing the authority designated by law to carry out the control regarding the official certification of seeds on the Romanian territory [66]. At the level of Romania, the cultivation of maize hybridization batches occupied an important place with a share between 15% and 25% of the total seed crops (figure no. 2.9).

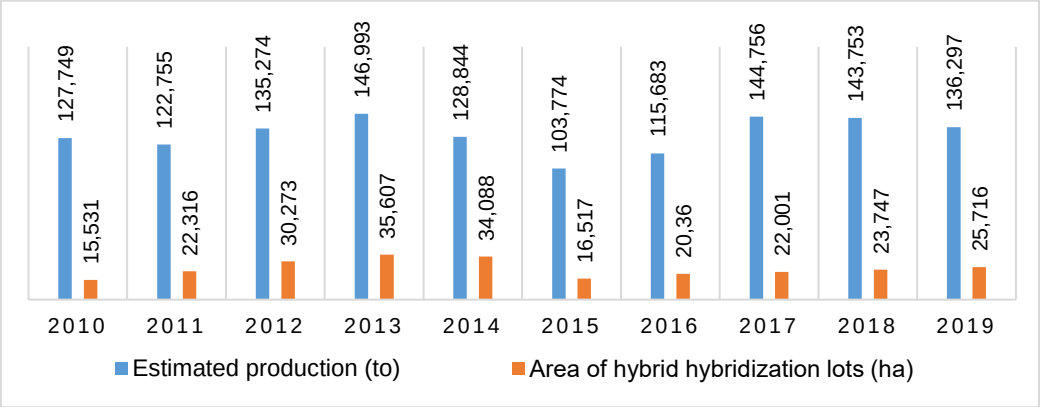

Figure no. 2.9. Area of seed crops at national level - own contributions based on INCS data [86]

From the analysis and graphical comparison of the data taken from INCS - MADR 2019, it appears that in the country there are several representative areas where maize hybridization batches are produced [86]. For over ten years, the counties of Brăila, Iași, Tulcea, Călărași, Ialomița have been the areas where over 98% of the hybrid corn seed from Romania is produced (figure no. 2.13).

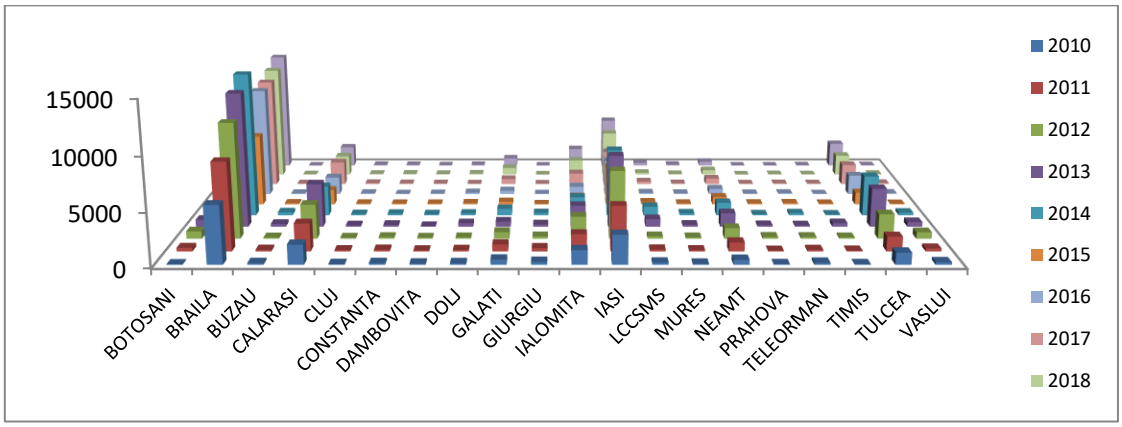

Figure no. 2.13. Areas sown with maize hybridization lots 2010-2019 - own contributions based on INCS data [86]

The hybrid seed productions obtained from the corn hybridization lots, at the level of Brăila county, were influenced both by the cultivation technologies used and by the parental forms with better and better cultural value, with high-performance characteristics, created in the breeding centers of multinational companies.

CHAPTER 3. DESIGN OF THE EXPERIMENTAL STUDY AND ANALYSIS OF PEDOCLIMATIC FACTORS

The experimental research was carried out during the years 2017-2019, in laboratory conditions and in field conditions, using established experimental and statistical research methods. The high demand for hybrid corn seed, as well as the avalanche of new hybrids, made the preliminary testing of the parental forms used to set up hybridization lots in the pedoclimatic conditions in the Bărăgan plain not take place, and in these conditions farmers often face with problems of adapting them to the conditions of the area, which substantially diminishes their harvest. The main stages of the experimental study are presented in figure no.3.2

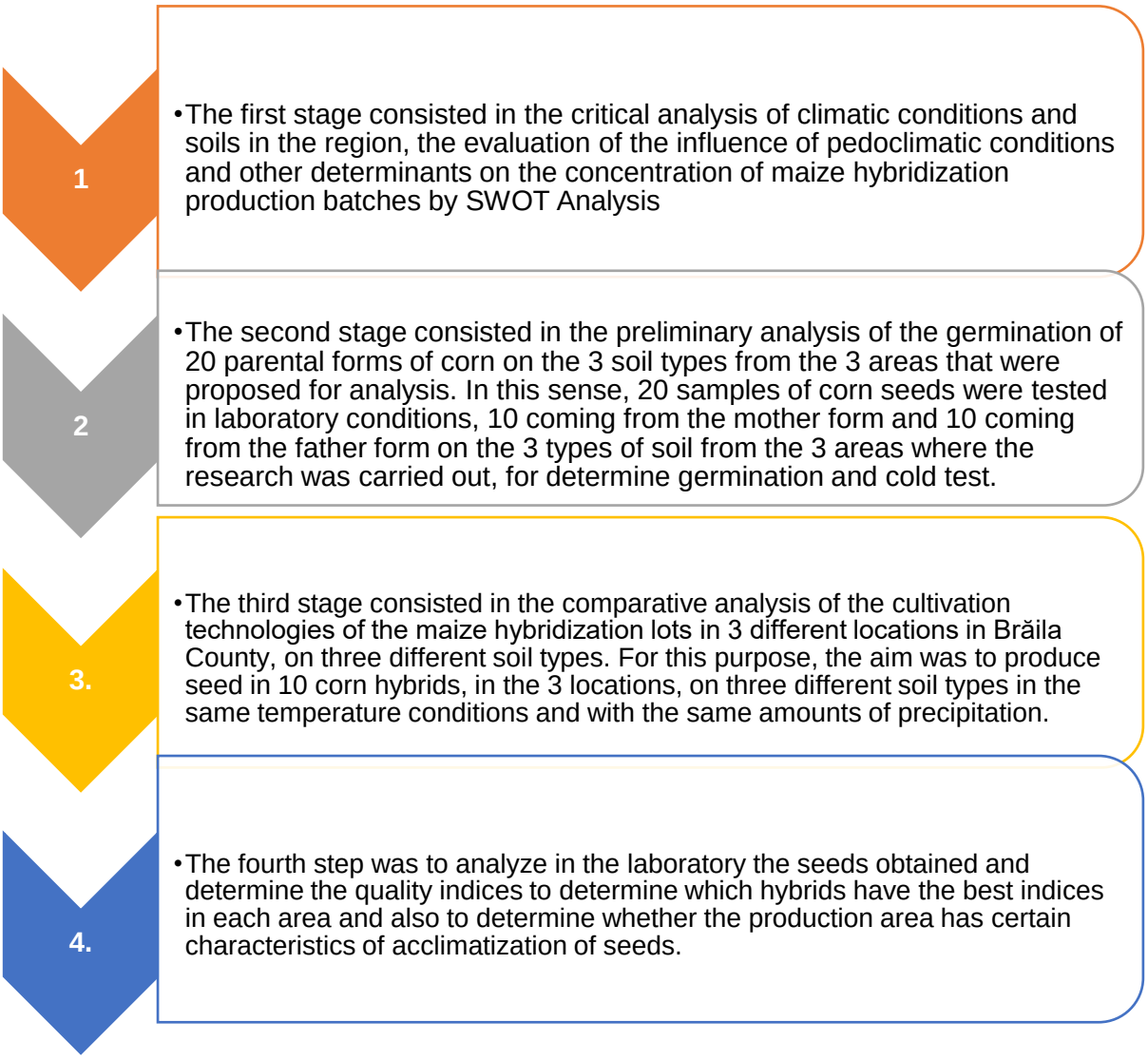

Figure no. 3.2. Stages of the study - own contributions

Farmers in this area have specialized in this production segment and in these conditions, annually want to increase their area, sometimes without respecting certain

technological elements, such as proper crop rotation and testing the seeds of parental forms before sowing. Under specific laboratory conditions, a complex preliminary study was performed on the influence of two experimental factors, genotype and soil from Vădeni, Unirea and Bărăganu, on germination and cold-test, for 20 parental forms of hybrid corn.

The field research was carried out for two years 2018 and 2019, on the land of several companies located in the three areas, in the county of Brăila, Vădeni, Unirea and Bărăganu, located on alluvial soils with clay-clay texture, typical chernozem and chernozem with coarse texture. The studies aimed at the interaction of 10 batches of maize hybridization with the main crop factors that influence the degree of pollination of the cob (NMS), the average weight of the cob (GMS), the average production (PM), and for the obtained seeds, the humidity (U%), germination (G%), mass of 1000 grains (MMB) and cold-test (CT), finally studying the influence of culture factors on the main quality indices and establishing the best batches of corn hybridization for the analyzed areas.

All the proposed stages had as final result the identification of the best hybridization batches of maize hybrids, with the best yields, on the three sites, Vădeni Unirea and Bărăganu, so that the results obtained to help farmers in those areas in making decisions appropriate cultivation.

Analysis of climatic conditions in 2017-2019 with reference to the study area

The whole territory of Brăila county is characterized by a temperate continental climate, with arid influences. The summers are very hot and with a pronounced dry air due to the continentalized air masses, the precipitations are reduced, with torrential character and unevenly distributed. Winters are dry and cold, with a thin layer of snow, unstable, with influences from the Siberian anticyclone [60].

At the level of Brăila county, the average temperatures measured at the weather station from SCDA had an increasing tendency from one year to another, with an average of 11,6 ºC in 2017, 11,8 ºC in 2018 and 12,9 ºC in 2019 (figure no. 3.5).

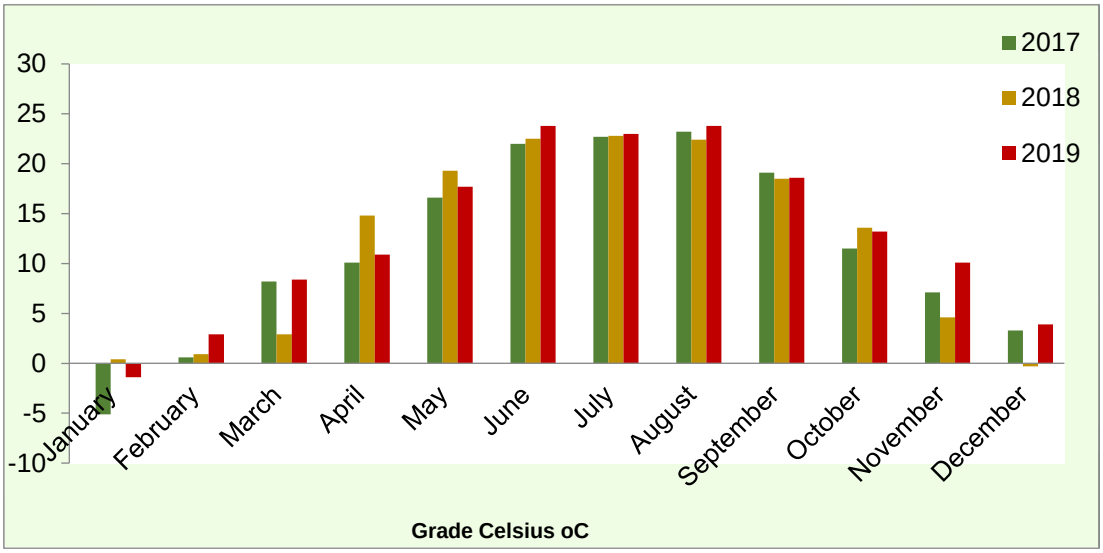

Figure no. 3.5. Average temperature measured at Brăila weather station (annex no. 1)

Water is another element of great importance for plants, without which they can not develop their vegetation and which comes mainly from atmospheric precipitation, falling in various forms, or from irrigation, where there are rivers and lakes and functional networks. of water supply to the plant area [104].

At the level of Brăila county, there is an uneven distribution of the amounts of precipitation that fell during 2017-2019, both during each year and during the three years taken as a whole.

In the three years studied, there is a decreasing trend in the amount of rainfall. If in 2017 there were months when they fell over 100 l / sqm, in 2018 the highest amount of precipitation was recorded in July, of 81 l / sqm and the minimum of 0 l / sqm in August (Annex no. 1). The total rainfall during the whole period of 2018 was insufficient for plants, registering the amount of 393.78 l / sqm (figure no. 3.6).

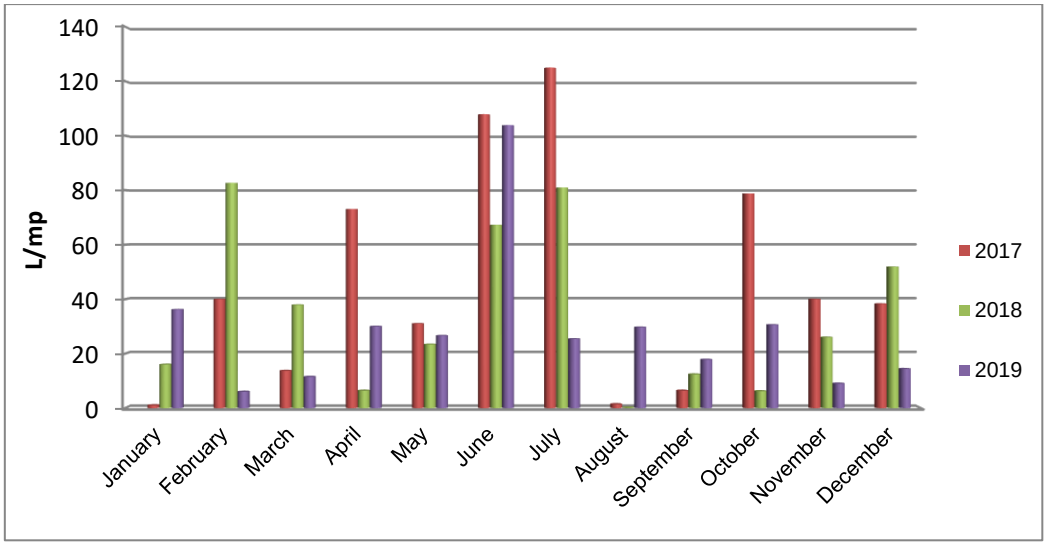

Figure no. 3.6. The amount of precipitation in Brăila county (Annex no. 1)

Brăila County is located in the Romanian Plain and generally has a uniform relief, the only changes being only running waters, lakes and creeks, as well as lake depressions. The geographical location, as well as the relief, climate and soils are favorable for the practice of agriculture. The pedoclimatic conditions in Brăila County determined the appearance and evolution of a diverse soil cover, dominated by chernozem zonal soils, azonal soils, alluvial, colluvial, undeveloped soils, psamosols, lacovişti [60].

SWOT analysis of the factors that determined the concentration of the cultivation of hybridization lots in the Bărăgan Plain

The SWOT analysis makes an identification of the factors that determined the concentration of seed production in the southeastern region of the country, in the Bărăgan plain in Brăila county, as well as an analysis of the factors that determined agricultural producers to specialize in this production segment. The results obtained are useful for the agricultural sector and for the business environment.

To illustrate the strengths and weaknesses of the hybrid maize seed production sector in this area, this analysis was designed as a series of comments on the main factors influencing the development of this sector (Figure 3.7).

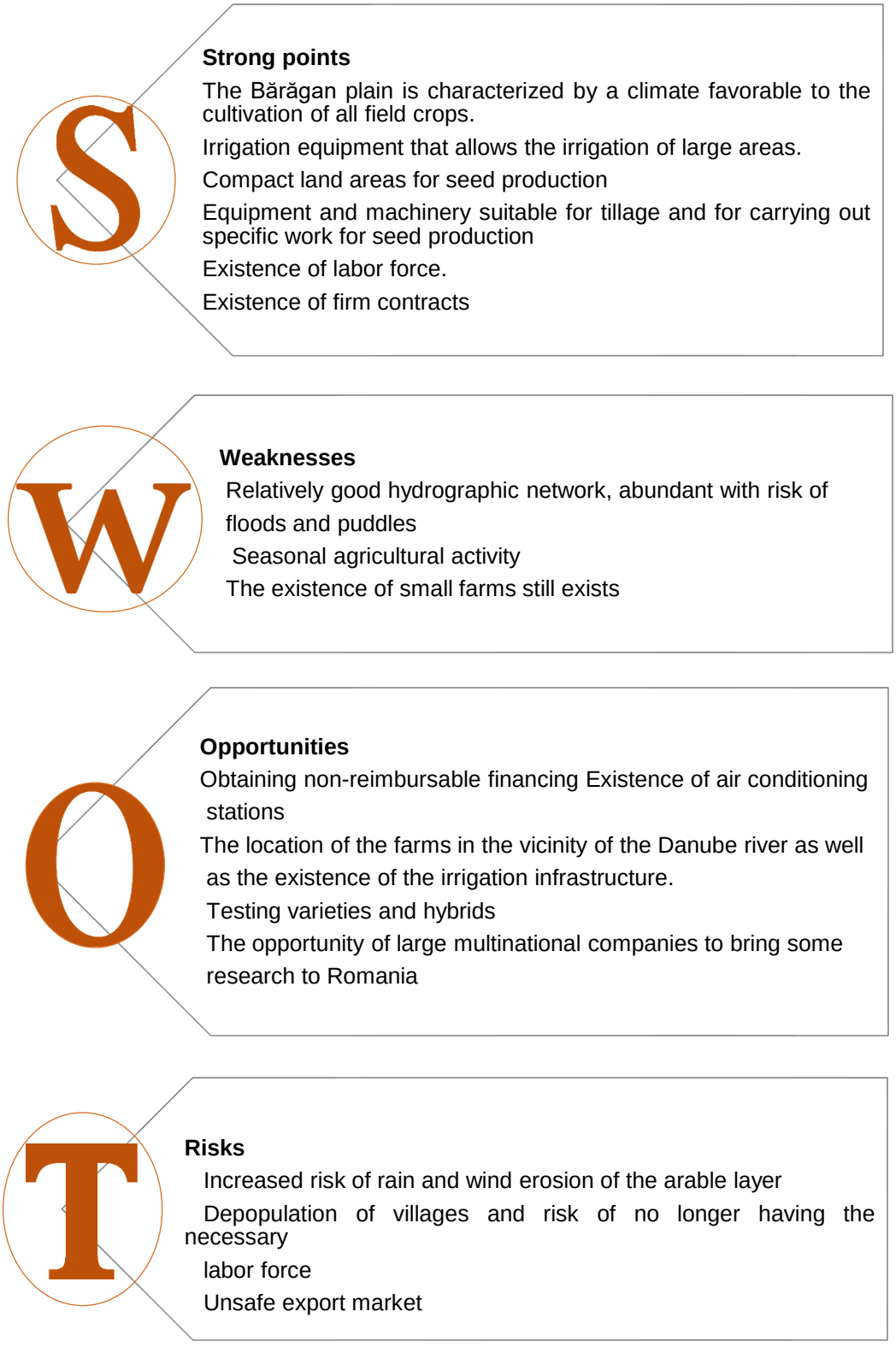

Figure no. 3.7. SWOT analysis performed by the author

CHAPTER 4. EXPERIMENTAL RESULTS

The experimental research carried out in the field aimed at the production capacity of the 10 hybrids obtained from the maize hybridization lots, in the pedoclimatic conditions of the three areas, from Vădeni, Unirea and Bărăganu localities.

Comparative analysis of cultivation technologies of maize hybridization batches established with parental forms

The experiments took place in 2018 and 2019 and aimed to select the most valuable genotypes in terms of production capacity and quality of hybrid seeds obtained in the soil and climatic conditions of the three areas in Vădeni, Unirea and Bărăganu. The agro-phytotechnical works applied in the experimental lots aimed to ensure the uniform emergence and growth of the plants throughout the vegetation period.

The biological material used in the experimental study are the parental forms of the hybrids registered in the official catalog of crop varieties and included in different FAO maturity groups.

The experiments were mono-factorial, following the degree of pollination and production, and the method of placing the variants was in Latin rectangle, in scattered blocks (experimental plots), without coming into contact with each other, each hybrid being grouped in experiments with a number of 3 repetitions, the surface of a plot being 24 sqm.

Frame technology used in the field The choice of land was the first stage that took place in establishing the location of the hybridization lots. In order to obtain productions that are satisfactory from a qualitative and quantitative point of view, some essential conditions were observed: the placement of the corn hybridization lots was done on lands with good fertility, as well as level, flat and free of weeds. Thus, in order to carry out the experiments in the three areas, smooth lands were chosen, without crevices and best prepared to have a more uniform emergence. In the experiments carried out, the land preparation works for the establishment of the experimental plots with hybridization lots were carried out very carefully in order to achieve a field as smooth and well prepared as possible. It was taken into account that the seeds of the inbred lines had less vigor and power of emergence and therefore, the preparation of the germination bed and the maintenance works were factors of major importance for the achievement of a uniform hybridization batch.

Thus, special works such as: infant, purified, castrated, the mother form were made more easily using less labor. The isolation of the isolation space was made in accordance with the legislative norms in force, according to which the seed maize crop complies, if it is located at a minimum isolation distance of 200 m from other maize crops or from other pollen-generating plants. , which could generate unwanted pollination [133]. The distance between the rows and between the plants one by one was calculated in such a way as to ensure good aeration so that the pollination of the plants is done as well as possible and the light which is the main element of the photosynthesis process and the filling of the grains .

The boxes of the sowing sections that distributed the seed were marked separately to avoid mixing with the seeds of the mother form. After sowing, the rows of the father form and the mother form were marked with differently colored stakes (figure no. 4.34).

Figure no. 4.34. Marking the rows in the hybridization batches experimental stage - own contributions

The maintenance works started immediately after sowing and consisted of 3 mechanical plows, at the same time the facial fertilization was done, two sprays to control pests and two herbicides, only with the products recommended for each hybrid. Irrigation began in the phase of 3-4 leaves in all hybrids and continued throughout the vegetation period, administering a number of 5 waterings for each hybrid.

The special works started from the moment when the atypical plants started to detach by removing them, castrating the mother form and eliminating the father form at the end of pollination. Fertilization was done in order to achieve an optimal ratio between the main macroelements N, P, K which must be 1.5: 1:1. The first maintenance work performed consisted of pest control from the early stages of vegetation. Weed control was a particularly important work because the presence of weeds in the hybridization batches causes an uneven growth of the parental forms which makes the gaps between the parental forms defective and compromises pollination and production. Due to the sensitivity of the parental maize lines, the pesticides were used sparingly and only those that were recommended and approved by the seed company. Irrigation was done according to the critical phases and the vegetation period of the corn and the aim was to ensure a soil moisture of 70-75% of the field capacity, by administering a number of 5 waterings. Biological purification was done in order to ensure the varietal purity of the parental forms and began when the atypical plants began to detach. These plants differ from the parent forms by a faster growth, different color and shape of the leaves. All atypical and heterozygous plants were removed, an operation that was completed by the beginning of flowering. Particular attention was paid to the removal of atypical or hybrid plants from the rows of pollinating parents, an operation that ended before the appearance of the ear. The castration of the mother form was the most important work in the hybridization batches, because it is the work on which the hybrid value of the seed depends and must be done before the panicles of the mother form begin to bloom. The mechanized work was completed by 3 other manual corrections made by teams of well-trained workers and organized in such a way that no plant remains uncastrated.

Because in conditions of drought and heat, the plants of the mother form are prone to trigger the opening of their anthers during the exit of the panicles from the bellows, the work of castration in the bellows phase of the corn has begun. All the works that were carried out in the hybridization lots were done in order to have the best possible flowering coincidence of the two parental forms, in order to achieve a correct pollination and to obtain a seed with varietal purity corresponding to the norms. in force. The production obtained in the experimental hybridization batches was the result of pollination of the two parental forms. Where there was a coincidence at flowering of the two parental forms the pollination was almost 100%. In the lots where the two parental forms did not reach the flowering phase at the same time, properly unpollinated lots appeared (figure no. 4.40).

Figure no. 4.40. Verification of the degree of pollination experimental stage. Corn cobs with hybrid seed - own contributions

Removal of the male form is another important operation that was performed after the pollination of the mother form and was done with maximum care so that the rows of plants belonging to the male form are completely removed before starting the harvest of the hybridization lot, so as not to contaminate the hybrid seed. (figure no.4.41).

Figure no. 4.41. Elimination of the male form after the end of pollination - experimental stage - own contributions

The harvesting of the hybridization lots from the experimental plots was done manually in order to avoid contamination and to be able to perform the proposed determinations as well as possible. The obtained results are presented in table no. 4.5).

Table no. 4.5. Average production calculated for the two experimental years 2018-2019-own contributions

Hybrid	Average production kg / ha Vădeni		Average production kg / ha Unirea		Average production kg / ha Bărăganu	
	2018	2019	2018	2019	2018	2019
P9903	6552	7640	7109	8494	7177	8419
DKC 4541	6708	8224	7776	9469	7974	8754
KWS KASHMIR	3740	4862	4867	4915	4689	4913
LOUBAZI CS	3580	5196	4474	5460	4229	5268
OLT	2953	5214	3066	5265	4308	5347
NEUTRON	2250	4160	2544	3430	1664	2462
ES INVENTIVE	2300	2842	2804	3006	2388	2745
EXTASIA	2600	2668	3314	2995	2610	2383
SY TALISMAN	2750	3197	2423	3458	2136	2253
GW9003	1850	3446	2276	4045	1802	3716

Determinations were made regarding the number of pollinated grains per cob, the estimated production, the mass of 1000 grains (MMB), humidity, germination and cold test.

4.4. Laboratory methodology for determining the qualitative and quantitative indices of each hybrid

The moisture content of the sample, expressed as a percentage of the initial mass of the specified sample, represents the loss of mass of the seeds by drying and was achieved according to the standard by drying in the oven [127]. The working sample consisting of 100 g of maize was homogenized and finely ground with a mill and then from each sample 2 samples of 25 g each were extracted, samples which were evenly distributed in two ampoules, which were weighed before and after filling, they were placed in the oven at a temperature of 103 degrees C and dried for 4 hours. Humidity expressed as a percentage by mass is calculated according to the formula:

$$U\% = M2 - M3 = \frac{100}{M2 - M1}$$

where:
U% - percentage of humidity
M1 - mass of the ampoule with the lid, in grams;
M2 - mass of the ampoule with the lid and contents before drying, in grams;
M3 - mass of the ampoule with the lid and contents after drying, in grams [127].

The analysis of the mass of 1000 seeds (MMB) was performed according to the standard and was expressed in grams [136]. It was performed by manual counting of the seeds at random, the grouping on repetitions of 100, then summed the weighing in grams, with the analytical balance of precision, was performed (table no. 4.7).

Table no. 4.7. Mass of 1000 grains of corn seeds in the period 2018-2019, own contributions

Hybrid		(MMB) (g) Vădeni		(MMB) (g)Unirea		(MMB) (g) Bărăganu	
		2018	2019	2018	2019	2018	2019
P9903		349	328	338	356	328	355
DKC 4541		282	263	272	278	255	275
KWS KASHMIR		253	253	260	258	261	256
LOUBAZI CS		251	248	262	255	235	245
OLT		356	355	358	352	352	348
NEUTRON		305	380	315	320	235	225
ES INVENTIVE		278	265	268	269	245	256
EXTASIA		205	231	245	255	215	210
SY TALISMAN		432	266	275	280	250	250
GW9003		271	262	280	290	263	275

The determination of the germination of the seeds obtained in the experimental lots was made on filter paper, according to the standard in force [131]. The working sample was extracted from a fraction of pure seed, using for each hybrid four repetitions of 100 seeds and

the substrate used was the filter paper which was previously soaked with water.To determine the Cold test, the preparation of the samples was performed by performing 4 repetitions of 100 seeds each extracted from a sample that was previously well homogenized by division, these being germinated according to the method described above. The determinations performed in the laboratory regarding the germination and cold-test of the seeds obtained from the experimental hybridization lots, are presented in table no. 4.8.

Table no. 4.8. Results obtained from laboratory tests, own contributions

Hybrid	**Vădeni**				**Unirea**				**Bărăganu**			
	Germination %		Cold -test %		Germination %		Cold -test %		Germination %		Cold -test %	
	2018	2019	2018	2019	2018	2019	2018	2019	2018	2019	2018	2019
P9903	97	96	96	96	97	96	96	96	96	96	96	96
DKC 4541	96	97	95	96	97	97	96	95	97	97	96	95
KWSKASHMR	96	92	92	94	96	92	92	92	92	92	92	95
LOUBAZI CS	96	94	92	92	97	94	92	94	94	94	92	94
OLT	95	95	92	93	94	95	93	92	95	94	93	93
NEUTRON	95	94	90	90	97	93	91	91	93	91	90	92
EXTASIA	95	92	89	92	94	95	91	93	94	93	92	89
GW9003	95	92	91	92	94	92	93	91	92	92	90	93
SYTALISMAN	95	94	89	91	95	93	90	91	95	93	89	90
ESINVENTIVE	92	93	87	86	93	93	86	88	90	93	86	86

The analysis of the behavior of the hybrids used in the two years, 2018-2019, in the experimental plots located in the three areas, Vădeni, Unirea and Bărăganu, highlighted the fact that obtaining hybrid corn seed is influenced by a number of factors that may or may not to be controlled by agronomists.

The experimental methodology presented above, based on the results obtained in the laboratory and field requires in order to achieve the main objective of research, namely the evaluation of the opportunity to maximize profit by selecting production objectives by behavioral evaluation of hybridization lots, scientific substantiation and value modeling obtained in order to quantify the probabilities of profit maximization by increasing the productive yield and increasing the quality of hybrid maize seeds.

CHAPTER 5. STATISTICAL ANALYSIS OF PRODUCTION OPTIONS AND VALORIZATION OF THE PRODUCTIVE MAXIMUM IN SPECIFIC PEDOCLIMATIC CONDITIONS

Purpose and assumptions

The purpose of the statistical research consists in the statistical segregation of the research of the experimental results by categories of hybrid seed material and the correlated interpretation of the results in relation to the general average of the lots included in the research to obtain the quality coefficient and productive yield. In order to evaluate the opportunities for maximizing the results of the statistical analysis, the statistical modeling procedures will be transposed to evaluate the statistical significance of the options to maximize the productive yield by the method of linear regression and growth curves in order to evaluate the most statistically significant model. then the data are entered in the matrix table and evaluated in terms of quantitative and qualitative parameters in order to evaluate the procedure of optimization and profit maximization. In order to achieve the proposed goal, software resources were used, respectively centralization and consolidation of databases in the Excel program of the Microsoft Office package, respectively the use of the statistical program SPSS version 25. Statistical data were collected in stages for the 10 hybrids in 3 locations and two phases (laboratory and field).

Data frequency distributions for the 10 hybrids analyzed

Regarding the average of the hybrids characterized by the average quality index 0.7489 and respectively by the productivity index 0.5299, mostly included in the semi-early maturity group. The average maturity group of hybrids was classified by the Food and Agriculture Organization through the maturity assessment system in the FAO group 350-390.

Field determinations were performed in the locations of Vădeni, Unirea, Bărăganu in Brăila County, during 2018-2019.

Regarding the average number of grains per cob, quantitative indicator, it reflects a variation of minimum-maximum amplitude on the range 85 grains - 355 grains, the average of the indicator being closer to the maximum limit of 192.25 grains. The median of the range of variation assimilated to the maximum point of the Gaussian curve is for the average of the hybrids, at the value of 180 grains, being calculated a standard error of the average of 8.54 grains which confirms the superior quality of the hybrid in terms of pollination.

For the NBS indicator, in the case of hybrids average, a standard deviation of 66.17 grains was calculated by analyzing the statistical frequencies of the lots. Flattening -0.23 and asymmetry 0.53 confirm the corresponding average productivity of maize hybrids (average productivity index 0.5299).

The analysis of the average weight of the grains per cob, quantitative indicator, reflects a variation of minimum-maximum amplitude in the range 22.04 grains per cob - 120.34 grains per cob, the average of the indicator being closer to the minimum at 54.62 grains per cob. The median of the range of variation assimilated to the maximum point of the Gaussian curve is for the average of the hybrids, at the value of 47.07 berries per cob, being calculated a standard error of the average of 2.98 berries per cob which confirms the superior quality of the hybrid from from the point of view of the degree of pollination, (figure no. 5.7).

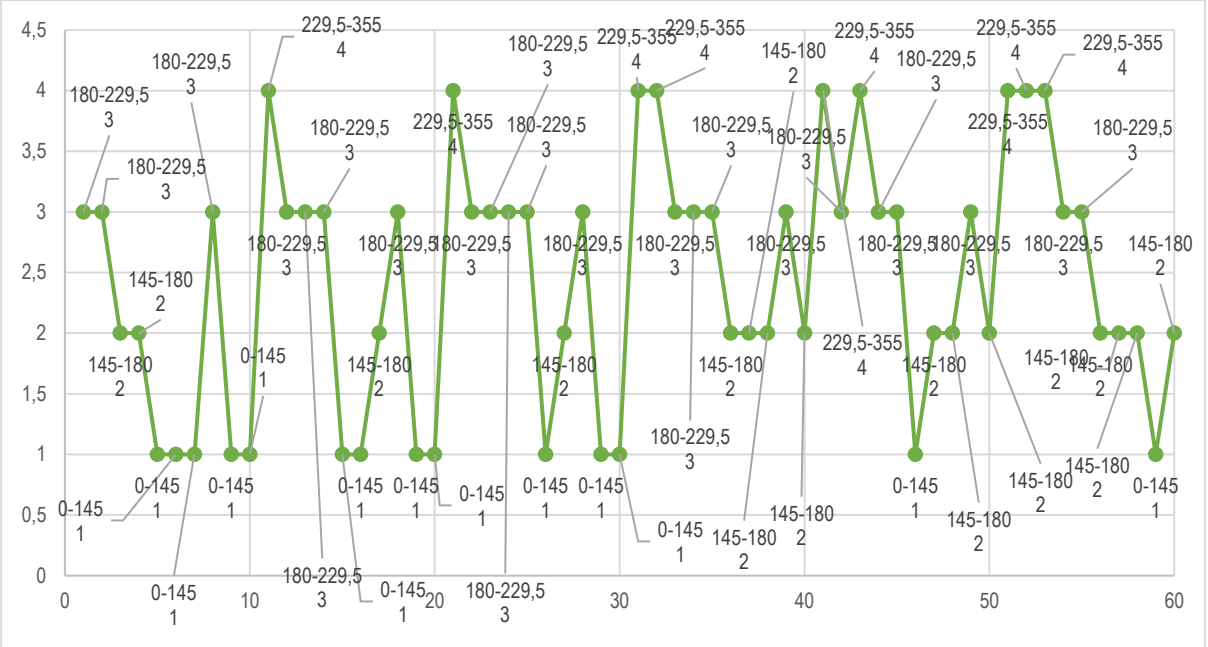

Figure no. 5.7. Histogram distribution of the average number of grains per cob (NBS) according to quartillic markers - own contributions

For the GMS indicator, in the case of the average hybrids, a standard deviation of 23.09 grains per cob was calculated by analyzing the statistical frequencies of the lots. Flattening 1.07 and asymmetry 1.18 confirm the corresponding average productivity of maize hybrids (average productivity index 0.5299), (figure no.5.8).

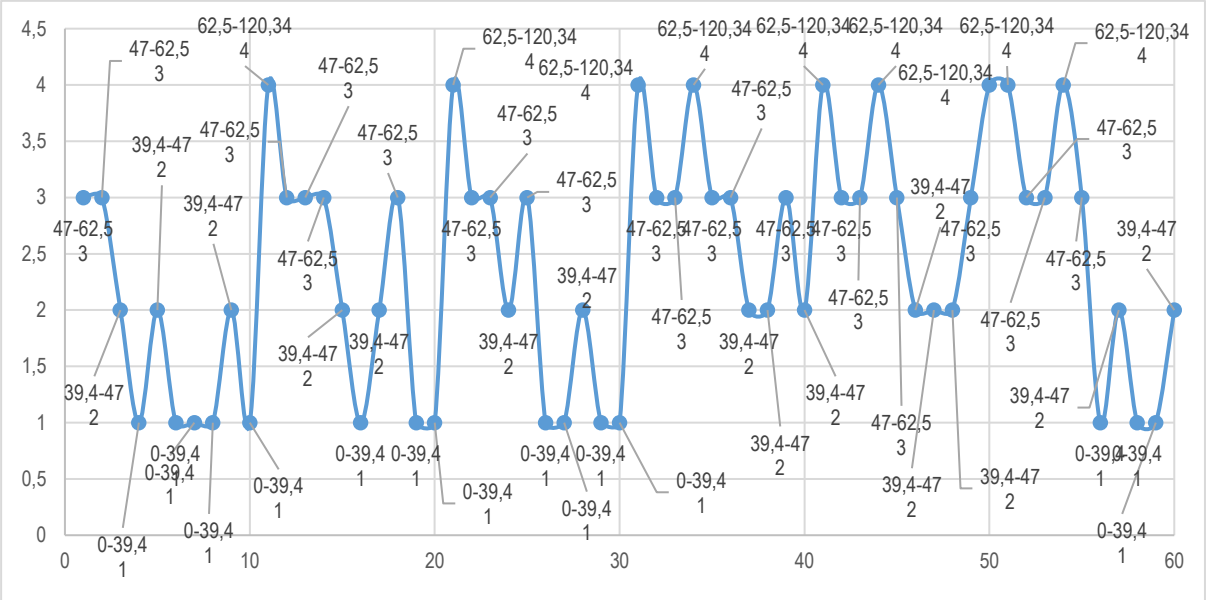

Figure no. 5.8. Histogram distribution of the average weight on the cob (GMS) according to quartile markers - own contributions

The average production per hectare, quantitative indicator, reflects a variation of minimum-maximum amplitude on the interval 1664 kilograms / hectare - 9469 kilograms / hectare, the average of the indicator being closer to the minimum limit at 4319.32 kilograms per hectare. The median of the range of variation assimilated to the maximum point of the Gaussian curve is for the average of the hybrids, at the value of 3648 kilograms per hectare, being calculated a standard error of the average of 268.61 kilograms per hectare which

confirms the superior quality of the hybrid from view of productive yield. For the PMha indicator in the case of hybrids average, a standard deviation of 2080.65 kilograms per hectare was calculated by analyzing the statistical frequencies of the lots. Flattening -0.27 and asymmetry 0.89 confirm the corresponding average productivity of maize hybrids (average productivity index 0.5299), (figure no. 5.9).

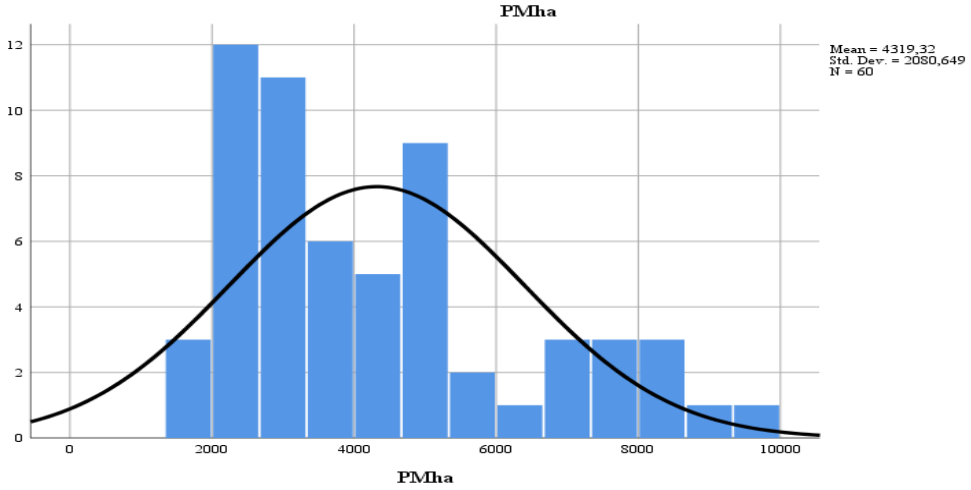

Figure no. 5.9. Histogram distribution of the average production indicator per hectare (PM ha) (n = 60) - own contributions

The humidity marker, qualitative indicator, reflects by analysis a variation of minimum-maximum amplitude on the interval 30.2% humidity of the grains at harvest - 22.4% humidity of the grains at harvest, the average of the indicator being closer to the minimum limit at 25.38%. The median of the range of variation assimilated to the maximum point of the Gaussian curve is for the average of the hybrids, at the value of 25.05% moisture of the grains at harvest, being calculated a standard error of the average of 0.27% which confirms the superior quality of the hybrid in terms of humidity level.

For the indicator U (grain moisture at harvest) in the case of the average hybrids, a standard deviation of 2.12% was calculated by analyzing the statistical frequencies of the lots. The flattening -1.08 and the asymmetry 0.36 confirm the good quality of the hybrids (general quality index 0.7489).

The analysis of the mass of 1000 grains, qualitative indicator, reflects a variation of minimum-maximum amplitude on the interval 205 grams - 432 grams, the average of the indicator being closer to the minimum limit at 282.55 grams. The median of the range of variation assimilated to the maximum point of the Gaussian curve is for the average of the hybrids, at 267 grams, being calculated a standard error of the average of 6.11 grams, which confirms the superior quality of the hybrid in terms of yield productive. For the MMBg indicator, in the case of the average of the hybrids, a standard deviation of 47.36 grams was calculated by analyzing the statistical frequencies of the lots. The flattening of 0.46 and the asymmetry of 0.94 confirm the good quality of the hybrids (general quality index 0.7489).

The analysis of the germination capacity, qualitative indicator, reflects a variation of minimum-maximum amplitude on the interval 90% - 97% of the average of the indicator being closer to the maximum limit at 94.3%. The median of the range of variation assimilated to the maximum point of the Gaussian curve is for the average of the hybrids, at 94%, being

calculated a standard error of the average of 0.23%, which confirms the superior quality of the hybrid in terms of capacity germ. For the G% indicator, in the case of the average of the hybrids, a standard deviation of 1.81% was calculated by analyzing the statistical frequencies of the lots. The flattening -0.85 and the asymmetry -0.11 confirm the good quality of the hybrids (general quality index 0.7489), (figure no. 5.13).

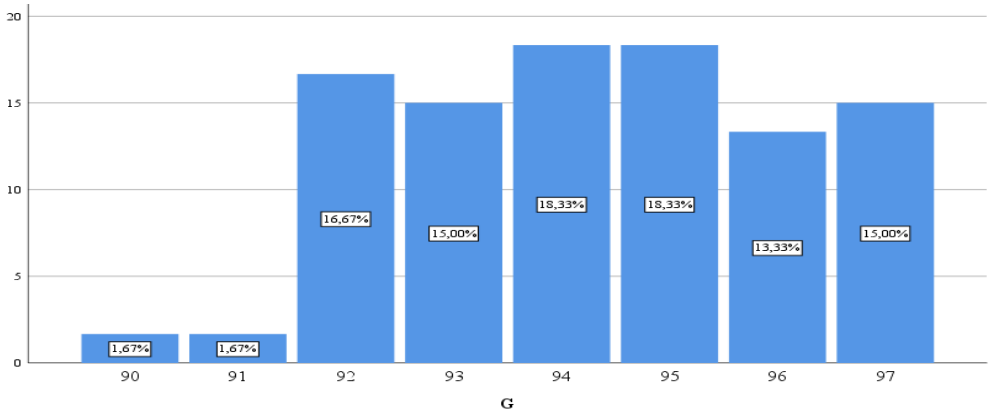

Figure no. 5.13. Distribution of the frequency series of the germination capacity indicator - own contributions

Performing the analysis on the cold test, a qualitative indicator, reflects a variation of minimum-maximum amplitude over the range of 86% - 96% of the average indicator being closer to the maximum limit at 91.95%. The median of the range of variation assimilated to the maximum point of the Gaussian curve is for the average of the hybrids, at 92%, being calculated a standard error of the average of 0.36%, which confirms the superior quality of the hybrid in terms of capacity to germinate under suboptimal conditions. For the CT% indicator in the case of hybrids average, a standard deviation of 2.76% was calculated by analyzing the statistical frequencies of the lots. The flattening -0.24 and the asymmetry -0.36 confirm the good quality of the hybrids (general quality index 0.7489), (figure no. 5.14).

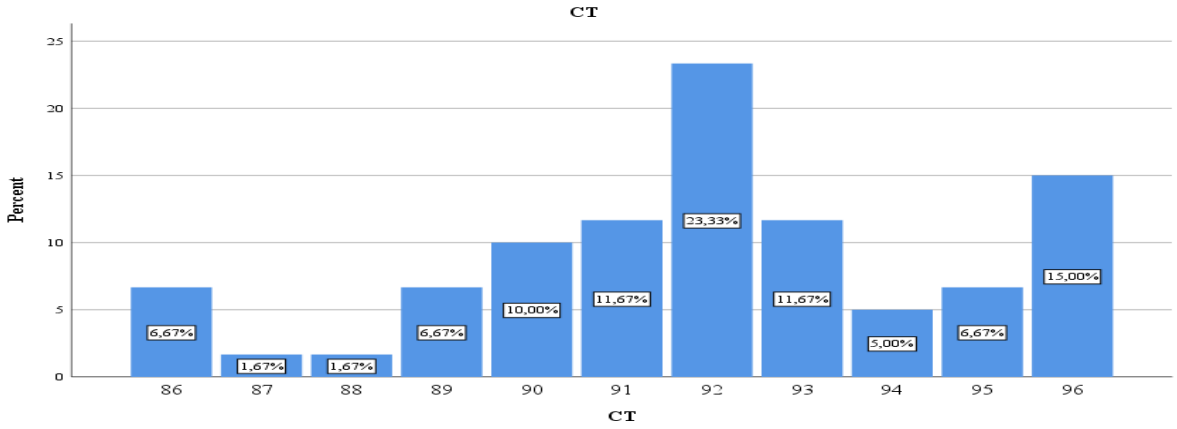

Figure no. 5.14. Cold-test analysis results for the 10 hybrids (frequency series analysis) - own contributions

In the case of the general average, the analysis highlighted a statistical distance of the average from the median (the peak of the Gaussian curve) which in all cases identified the agglomeration of values in the upper part of the median interval between quartile 2 and 3 which indicates that the average values and qualitatively of the hybridization lots are in accordance with the general productivity parameters, the difference between the lots being determined on the one hand by the standard of the producers and on the other hand by the type of soil used and the technological processes used. This observation confirms that the optimization process presented by the main objective of the research is possible and feasible to perform.

Individual data frequency distributions for each hybrid analyzed

DKC 4541 hybrid

In the period 2018-2019, a series of field determinations were performed on the DKC 4541 hybrid, in Vădeni, Unirea, Bărăganu locations in Brăila County, this being a semi-early hybrid, included in the FAO 290 maturity group, classified by Food and Agriculture Organization through the maturity assessment system, recommended to farmers who apply an appropriate cultivation technology, having a good reaction on all soil types (figure no.5.16).

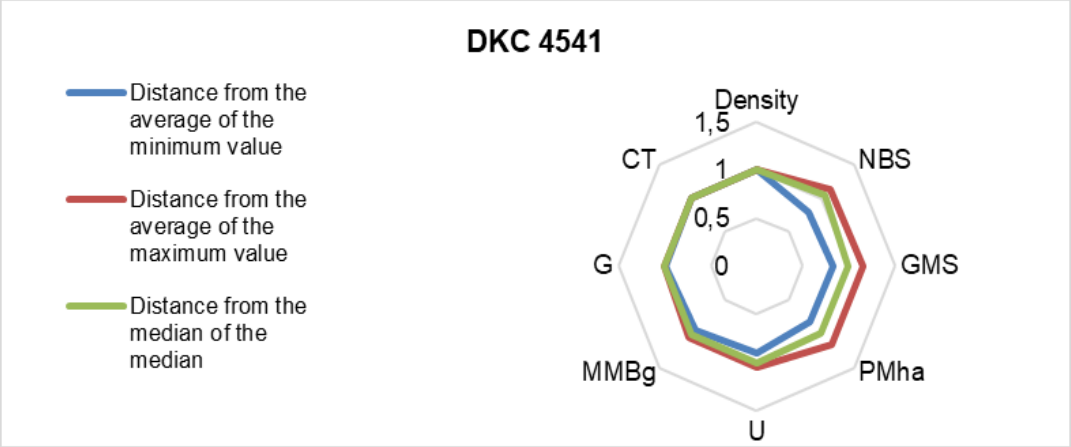

Figura nr. 5.16. Analiza distribuției minim - maxim a indicatorilor cantitativi și calitativi în cazul hibridului DKC 4541 - contribuții proprii

The quantitative and qualitative indices showed a uniformity that in the two years had close values both in terms of germination and in terms of cold test. The tests showed that the seed obtained has a good stability on the three types of soil where they were analyzed.

ES INVENTIVE hybrid characterized by a vigorous root system that ensures good drought tolerance and fast drying capacity of grains at harvest, classified by the Food and Agriculture Organization (FAO) through the maturity assessment system, in the semi-maturity group -time, the FAO 300 group, is another hybrid for which field determinations were performed in the locations of Vădeni, Unirea, Bărăganu in Brăila County, during 2018-2019.

For the hybrid ES INVENTIVE the analysis of the minimum and maximum distribution of qualitative and quantitative indicators is represented in figure no. 5.21.

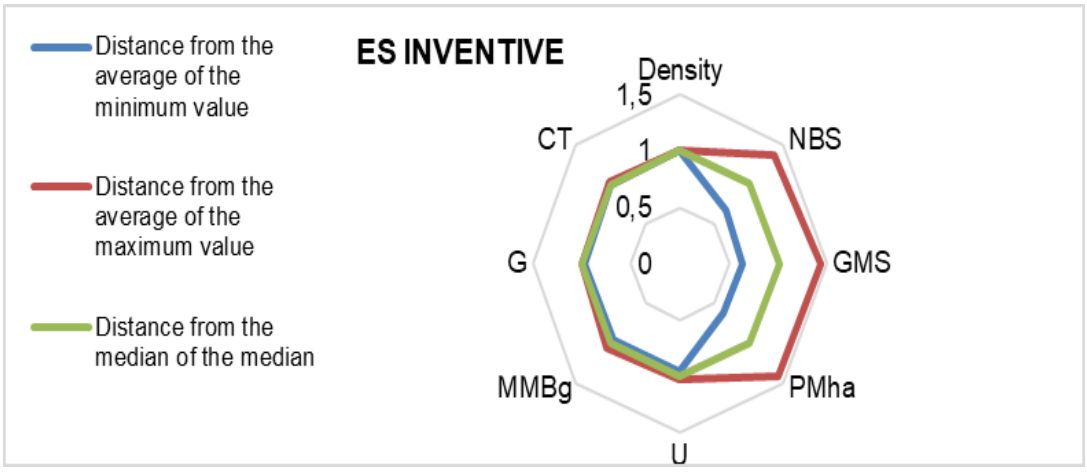

Figure no. 5.21. Analysis of the minimum - maximum distribution of quantitative and qualitative indicators in the case of the hybrid ES INVENTIVE - own contributions

The hybrid EXTASIA, is a simple hybrid that is characterized by vigorous plants with good disease tolerance, recommended for use in intensive cultivation technologies, is included in the semi-late maturity group, classified by the Food and Agriculture Organization through the evaluation system of maturity in the FAO 400 group.

In the period 2018-2019, field determinations were performed in the locations of Vădeni, Unirea, Bărăganu in Brăila County, on three distinct types of soil, chernozem, loam-clay, sandy soil, where the presented data were determined in table no. 5.3.

Table no. 5.3. Individual data frequency distributions for the EXTASIA hybrid-own contributions

EXTASIA	Valori minimale	Valori maximale	Valori medii	Mediana	Eroarea standard a mediei	Deviația standard	Aplatizarea	Asimetria
Densitate	65000	65000	65000	65000	0,00	0,00	0,00	0,00
NBS	127	172	156,6667	163	6,63	16,23	2,24	-1,51
GMS	35,3	46,26	41,235	42,69	1,75	4,28	-1,36	-0,57
PMha	2300	3006	2680,833	2774,5	112,81	276,33	-1,39	-0,56
U	22,4	24,5	23,25	23,2	0,30	0,73	1,23	0,91
MMBg	245	278	263,5	266,5	4,70	11,50	0,38	-0,68
G	92	95	93,83333	94	0,48	1,17	-0,45	-0,67
CT	89	93	91	91,5	0,68	1,67	-1,79	-0,38

The hybrid **GW 9003,** characterized by good resistance to disease and drought and included in the semi-early maturity group, FAO group 370, classified by the Food and Agriculture Organization through the maturity assessment system, determinations were made in 2018-2019, in field in the locations Vădeni, Unirea, Bărăganu from Brăila county.

In the **KWS KASHMIR** hybrid, a simple hybrid characterized by good drought and heat resistance and included in the semi-early maturity group, FAO group 370, classified by the Food and Agriculture Organization through the maturity assessment system, field determinations were performed in the locations Vădeni, Unirea, Bărăganu from Brăila county, in the period 2018-2019. According to the research carried out by the author, on three distinct types of soil, chernozem, loam-clay, sandy soil, variations of the indices determined in the experimental groups were found.

The LOUBAZI CS hybrid is characterized by a good stability to the conditions in our country and a good resistance to heat and drought, included in the semi-early maturity group, classified by the Food and Agriculture Organization through the maturity assessment system in the FAO 350 group. field determinations were performed in the locations of Vădeni, Unirea, Bărăganu in Brăila County, in the period 2018-2019 on three distinct soil types, alluvial, typical chernozem and coarsely textured chernozem. The graphical representation of the qualitative and quantitative indicators was performed by analyzing the minimum-maximum distribution, according to figure 5.41.

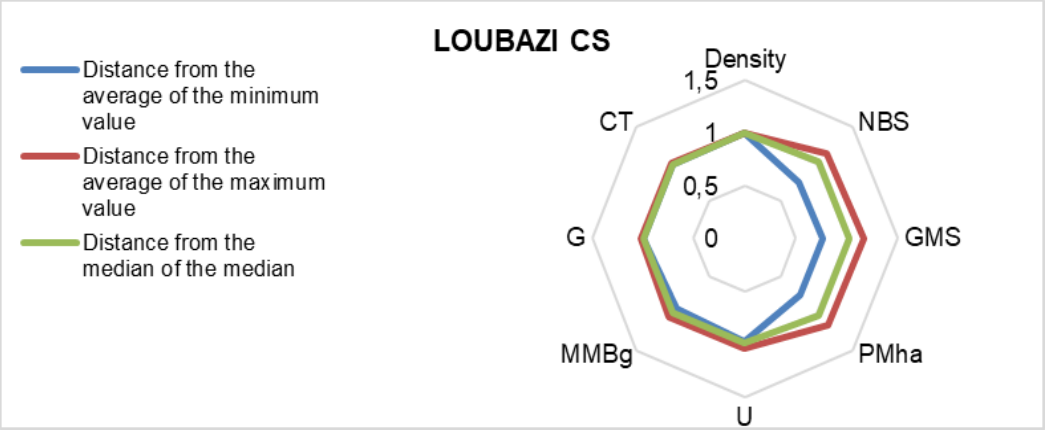

Figure no. 5.41. Analysis of the minimum - maximum distribution of quantitative and qualitative indicators in the case of the LOUBAZI CS hybrid - own contributions

The **NEUTRON** hybrid characterized by vigorous plants and good adaptability to all soil types, included in the semi-late maturity group, FAO 400 group, classified by the Food and Agriculture Organization through the maturity assessment system, was analyzed and determinations were made. in the field in the locations Vădeni, Unirea, Bărăganu from Brăila county, in the period 2018-2019.

The graphical representation of the qualitative and quantitative indicators was performed by analyzing the minimum-maximum distribution. The flattening -0.12 and the asymmetry 0.69 confirm the low quality of the hybrid (figure no. 5.46).

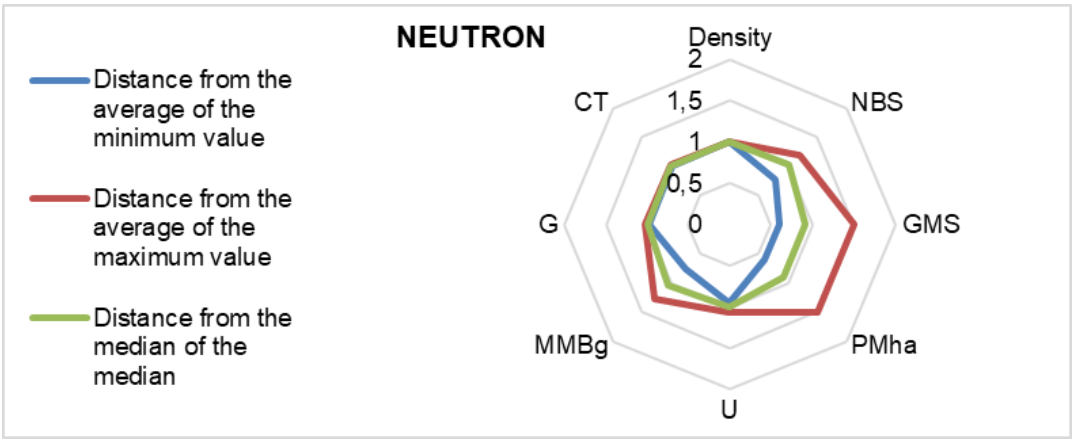

Figure no. 5.46. Analysis of the minimum - maximum distribution of quantitative and qualitative indicators in the case of the NEUTRON hybrid - own contributions

The **OLT** hybrid is a drought and heat tolerant native hybrid, cultivated in all areas of the plain and included in the semi-late maturity group, FAO 430 classified by the Food and Agriculture Organization through the maturity assessment system. Field determinations were performed in the period 2018-2019, in the three locations Vădeni, Unirea, Bărăganu in Brăila County.

The analysis of the minimum - maximum distribution of the quantitative and qualitative indicators in the case of the OLT hybrid was represented graphically in figure no. 5.51.

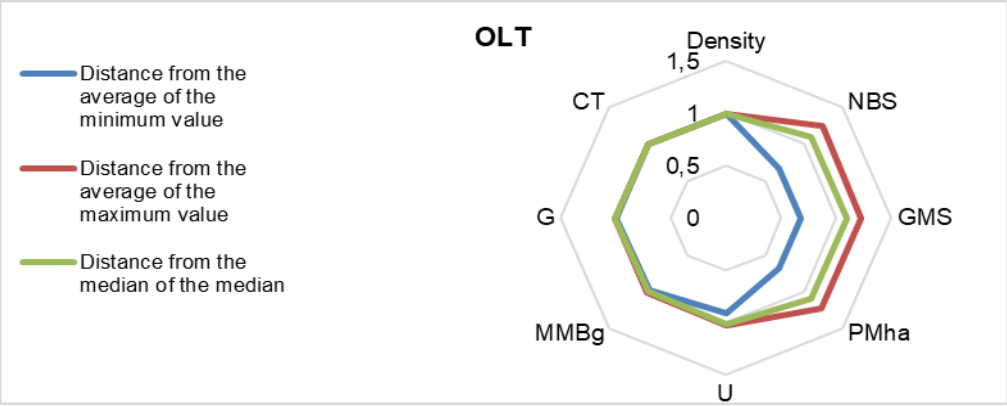

Figure no. 5.51. Analysis of the minimum - maximum distribution of quantitative and qualitative indicators in the case of the OLT hybrid - own contributions

The **P9903** hybrid was registered in the official catalog in 2014 and belongs to Pioneer Hi-Bred Services GmbH. It is a semi-early hybrid, created especially for conditions of excessively continental climate. It has a vegetation period of 119-124 days and is part of the FAO 360 maturity group.

The hybrid P9903 characterized by a very good tolerance to drought and heat and included in the semi-early maturity group, FAO 360 group, classified by the Food and Agriculture Organization through the maturity assessment system, was field tested in 2018-2019 in the locations Vădeni, Unirea, Bărăganu from Brăila county.

In the **SY TALISMAN** hybrid characterized by a good adaptation to various climatic conditions and different technologies, included in the extra-early maturity group, in the FAO 220 group, classified by the Food and Agriculture Organization through the maturity assessment system, determinations were made. in the field in the locations Vădeni, Unirea, Bărăganu from Brăila county, in the period 2018-2019. The determination of the quantitative and qualitative indicators for the SY TALISMAN hybrid was represented graphically in figure no. 5.61.

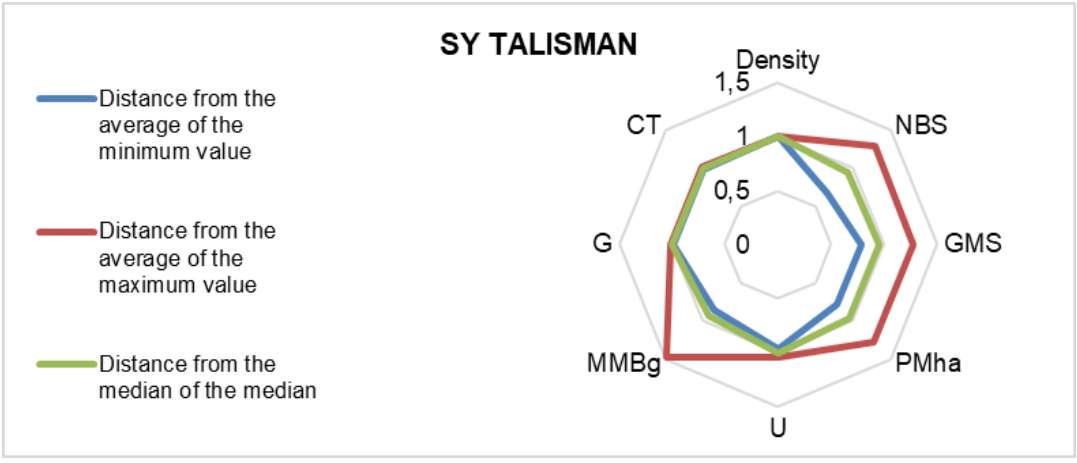

Figure no. 5.61. Analysis of the minimum - maximum distribution of quantitative and qualitative indicators in the case of the SY TALISMAN hybrid - own contributions

Statistical modeling of results

The results obtained by studying the individual frequency distributions of the hybrids included in the experimental sample as well as the results obtained at the level of the whole sample of hybrids allow the qualitative and quantitative scaling of hybrids in relation to the general average (Table no. 5.11).

Table no. 5.11. Qualitative and quantitative scaling of hybrids in relation to the general average, own contributions

Hibridul	An	FAO	Densitate	NBS	GMS	PMha	U	MMBg	G	CT
DKC 4541	2018 - 2019	350	111683	269,83	72,9817	8150,83	25,783	270,83	96,83	95,5
ES INVENTIVE	2018 - 2019	350	79714	128	35,1333	2855,83	23,933	273,5	92,33	86,5
EXTASIA	2018 - 2019	350	65000	156,67	41,235	2680,83	23,25	263,5	93,83	91
GW 9003	2018 - 2019	430	66000	184,33	41,85	2761,67	28,25	226,83	92,83	91,67
KWS KASHMIR	2018 - 2019	400	83571	217,33	55,8233	4664,33	27,817	256,83	93,33	92,83
LOUBAZI CS	2018 - 2019	300	92307	204,33	50,9117	4701,17	23,283	249,33	94,83	92,67
NEUTRON	2018 - 2019	370	75500	122	36,465	2751,67	25,617	296,67	93,83	90,67
OLT	2018 - 2019	400	68000	181,67	64,1083	4358,83	26,717	353,5	94,67	92,67
P9903	2018 - 2019	380	70588	315,83	107,1817	7565,17	25,95	342,33	96,33	96
SY TALISMAN	2018 - 2019	300	66775	142,5	40,4617	2702,83	23,217	292,17	94,17	90
MEDIA GENERALĂ		**363**	**77913,8**	**192,25**	**54,6152**	**4319,32**	**25,382**	**282,55**	**94,3**	**91,95**

The distribution of the research results compared to the maximum result of the best hybrid was made based on the mobile averages distributed horizontally in the sample of hybrids subjected to experimentation in relation to the overall average evaluated at the level of the whole sample for each quantitative and qualitative indicator analyzed. The value 1 of the distribution represents the qualitative maximum obtained by the comparative procedure for a hybrid in part and is reported as a unique value / indicator in the whole group of hybrids subjected to expertise (experimental analysis) (table no.5.12.).

Table no. 5.12. Distribution of research results against the maximum result of the best hybrid, own contributions

Hybrid	Density	NBS	GMS	PMha	U	MMBg	G	CT
DKC 4541	**1,0000**	0,8544	0,6809	**1,0000**	0,9005	0,7661	**1,0000**	0,9948
ES INVENTIVE	0,7138	0,4053	0,3278	0,3504	0,9701	0,7737	0,9535	0,9010
EXTASIA	0,5820	0,4961	0,3847	0,3289	0,9986	0,7454	0,9690	0,9479
GW 9003	0,5910	0,5836	0,3905	0,3388	0,8218	0,6417	0,9587	0,9549
KWS KASHMIR	0,7483	0,6881	0,5208	0,5723	0,8346	0,7265	0,9639	0,9670
LOUBAZI CS	0,8265	0,6470	0,4750	0,5768	0,9972	0,7053	0,9793	0,9653
NEUTRON	0,6760	0,3863	0,3402	0,3376	0,9063	0,8392	0,9690	0,9445
OLT	0,6089	0,5752	0,5981	0,5348	0,8690	**1,0000**	0,9777	0,9653
P9903	0,6320	**1,0000**	**1,0000**	0,9281	0,8947	0,9684	0,9948	**1,0000**
SY TALISMAN	0,5979	0,4512	0,3775	0,3316	**1,0000**	0,8265	0,9725	0,9375

TOTAL	0,6976	0,6087	0,5096	0,5299	0,9147	0,7993	0,9739	0,9578

Based on the results from table no. the stability of the parental lines and the degree of pollination, as well as the superior characteristics of the germination and cold-test indices, of the hybrids DKC4541 and P9903 as shown in the table below (table no. 5.13.).

Table no.5.13. Ranking for qualitative and quantitative composite indices of the analyzed hybrids, own contributions

Hybrid	Maize hybrids quality index	Ranking quality	Productivity index of maize hybrids	Ranking productivity
DKC 4541	0,8996	2	1,0000	1
ES INVENTIVE	0,6744	9	0,3504	6
EXTASIA	0,6816	7	0,3289	10
GW 9003	0,6601	10	0,3388	7
KWS KASHMIR	0,7527	5	0,5723	4
LOUBAZI CS	0,7715	3	0,5768	3
NEUTRON	0,6749	8	0,3376	8
OLT	0,7661	4	0,5348	5
P9903	0,9273	1	0,9281	2
SY TALISMAN	0,6868	6	0,3316	9
GENERAL AVERAGE	**0,7489**	**x**	**0,5299**	**x**

Demonstration of working hypotheses

Working hypothesis 1 assumed that the distribution of the maturity group in the statistical sample respects the characteristics of each hybrid, the hypothesis was demonstrated by reducing to nonsense the null hypothesis, namely:

The distribution of maturity groups is the same regardless of the type of hybrid grown.

The Kruskal Wallis test was applied, the result of which for the variable plant density / ha generated a statistical significance higher than 99.99% at a test value of 45 out of a total of 60 determined values, at a number of 9 degrees of freedom (Annex 4).

The distribution according to the test of independent samples reflects the fact that the normal favorable distribution of the optimal values of the plant maturity group is between 350 FAO and 400 FAO, there is the hybrid GW9003 with FAO group of 430 but also a number of 5 hybrids whose FAO group is below the optimal limit. Following the application of the Kruskal Wallis test, the decision was rejected by the null hypothesis. Working hypothesis 2 assumed that the density / ha is achieved in accordance with the productive characteristics of the hybrid. The hypothesis was proved by reducing to nonsense the null hypothesis, namely:

The distribution of plant density per ha is the same for all analyzed lots. The Kruskal Wallis test was applied, the result of which for the variable plant density / ha generated a statistical significance of more than 99.99% at a test value of 59 out of a total of 60 determined values, at a number of 9 degrees of freedom. The distribution according to the test of independent samples reflects the fact that the normal favorable distribution of the optimal values of plant density per ha is between 70,000 and 95,000 plants per ha, there is the hybrid DKC4541 with a higher yield of over 110,000 plants per ha but also a number of another 5 hybrids whose density is below the optimal limit. The decision taken following the application of the Kruskal Wallis test was to reject the null hypothesis.

Working hypothesis 3 assumed that the distribution of the number of grains per cob (NBS) respects the productive characteristics of hybrids, the hypothesis was demonstrated by reducing to nonsense the null hypothesis, namely:

The distribution of the number of grains on NBS cobs is the same for all the analyzed lots. The Kruskal Wallis test was applied, the result of which for the variable number of grains per cob (NBS) generated a statistical significance of more than 99.99% at a test value of 45.37 out of a total of 60 determined values, at a number of 9 degrees of freedom (Annex 4).

The distribution according to the test of independent samples reflects the fact that the normal favorable distribution of the optimal values of the number of berries per cob (NBS) is between 180 and 300 berries per cob, there is the hybrid P9903 with a higher yield of over 330 berries per cob, but also a number of other 5 hybrids whose NBS are below the optimal limit. The decision taken following the application of the Kruskal Wallis test was to reject the null hypothesis (figure no. 5.67).

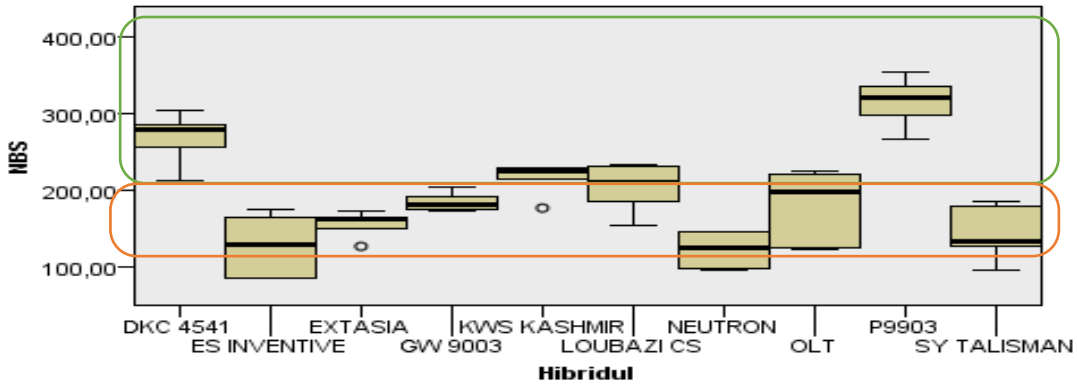

Figure no. 5.67. Application of the Kruskal Wallis test to validate working hypothesis 3 - own contributions

Working hypothesis 4 assumed that the average weight of the grains per cob (GMS) is achieved in accordance with the productive characteristics of the hybrid. The hypothesis was proved by reducing to nonsense the null hypothesis, namely:

The distribution of the average weight of the grains on the cobs is the same for all the analyzed lots. The Kruskal Wallis test was applied, the result of which for the GMS variable generated a statistical significance of more than 99.99% at a test value of 42.72 out of a total of 60 determined values, at a number of 9 degrees of freedom.

The distribution according to the test of independent samples reflects the fact that the normal favorable distribution of the optimal values of the average weight of the grains on the cob (GMS) is between 50 grams and 100 grams, there is the hybrid P9903 with a higher yield of over 110 grams and a number of others. 5 hybrids whose GMS is below the optimal limit.

The decision taken following the application of the Kruskal Wallis test was to reject the null hypothesis (Working Hypothesis 5 assumed that the mass of 1000 grains (MMB) is made in accordance with the qualitative characteristics of the hybrid. null hypothesis, namely: The mass of 1000 grains (MMB) is the same for all analyzed batches. The Kruskal Wallis test was applied, the result of which for the variable mass of 1000 grains (MMB) generated a statistical significance of more than 99.99% at a test value of 39,087 out of a total of 60 determined values, at a number of 9 degrees of freedom.

The distribution according to the test of the independent samples reflects the fact that the normal favorable distribution of the optimal values of mass of 1000 grains (MMB) is between 260 and 350 grams, there is the Olt hybrid with a higher yield of over 350 g but also a number of other 5 hybrids. whose mass of 1000 grains (MMB) is less than the optimum limit. The decision taken following the application of the Kruskal Wallis test was to reject the null hypothesis (figure no. 5.69).

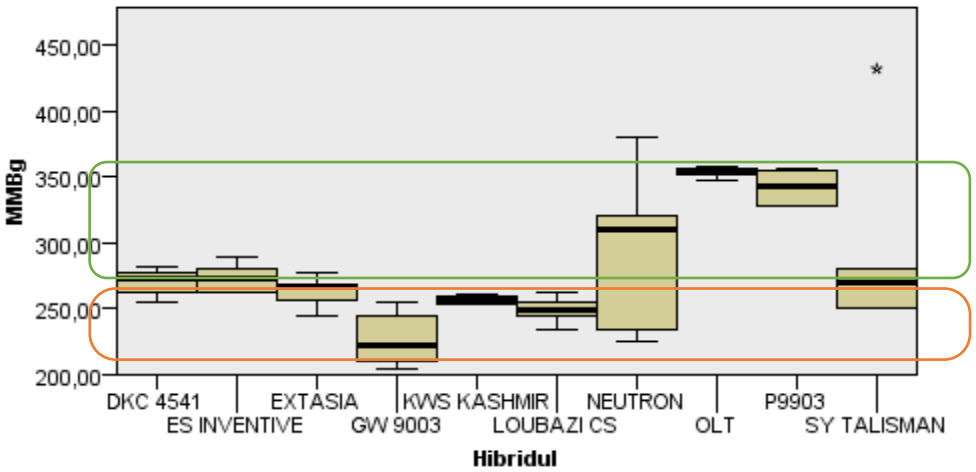

Figure no. 5.69. Application of the Kruskal Wallis test to validate working hypothesis 5 - own contributions

Working hypothesis 6 assumed that the average production kg / ha (PM ha) is achieved in accordance with the productive characteristics of the hybrid. The hypothesis was demonstrated by reducing to nonsense the null hypothesis, namely: The average production kg / ha (PM ha) is the same for all lots analyzed.

The Kruskal Wallis test was applied, the result of which for the variable average yield kg / ha (PM ha) generated a statistical significance of more than 99.99% at a test value of 46.36 out of a total of 60 determined values, at a number of 9 degrees of freedom.

The distribution according to the test of independent samples reflects the fact that the normal favorable distribution of the optimal values of average yield kg / ha (PM ha) is between 3000 and plants per ha, there is the hybrid DKC4541 with a higher yield of over 8000 kg / ha and the hybrid P9903 with an average production of over 7000 kg / ha but also a number of other 5 hybrids whose average production is below the optimal limit. The decision taken following the application of the Kruskal Wallis test was to reject the null hypothesis (figure no. 5.70).

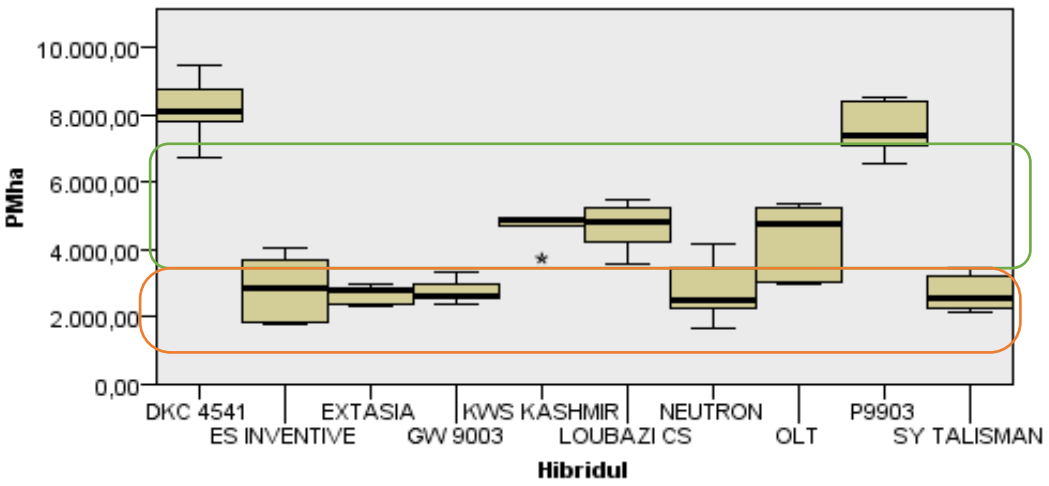

Figure no. 5.70. Application of the Kruskal Wallis test to validate working hypothesis 6 - own contributions

Working hypothesis 7 assumed that the moisture distribution (U%) is made according to the qualitative characteristics of the hybrid. The hypothesis was demonstrated by reducing to nonsense the null hypothesis, namely: The moisture distribution (U%) is the same for all analyzed lots. The Kruskal Wallis test was applied, the result of which for the variable U%

generated a statistical significance greater than 99.99% at a test value of 42.80 out of a total of 60 determined values, at a number of 9 degrees of freedom .

The distribution according to the test of independent samples reflects the fact that the normal favorable distribution of the optimal values of humidity is between 24% and 28%, there is the hybrid GW9003 with an increased humidity of over 28% but also a number of other 5 hybrids whose humidity is lower. compared to the optimal limit. The decision taken following the application of the Kruskal Wallis test was to reject the null hypothesis

Working hypothesis 8 assumed that the germination index is performed in accordance with the qualitative characteristics of the hybrid seeds. The hypothesis was proved by reducing to nonsense the null hypothesis, namely: The germination of hybrid seeds is the same for all analyzed lots. The Kruskal Wallis test was applied, the result of which for the germination variable (G%) generated a statistical significance of more than 99.99% at a test value of a total of 60 determined values, at a number of 9 degrees of freedom. .

The distribution according to the test of independent samples reflects the fact that the normal favorable distribution of the optimal values of seed germination is between 94% and 96%, there is the hybrid DKC4541 with a germination of over 98% but also a number of other 5 hybrids whose germination is below the limit. optimal. The decision taken following the application of the Kruskal Wallis test was to reject the null hypothesis (figure no. 5.72)

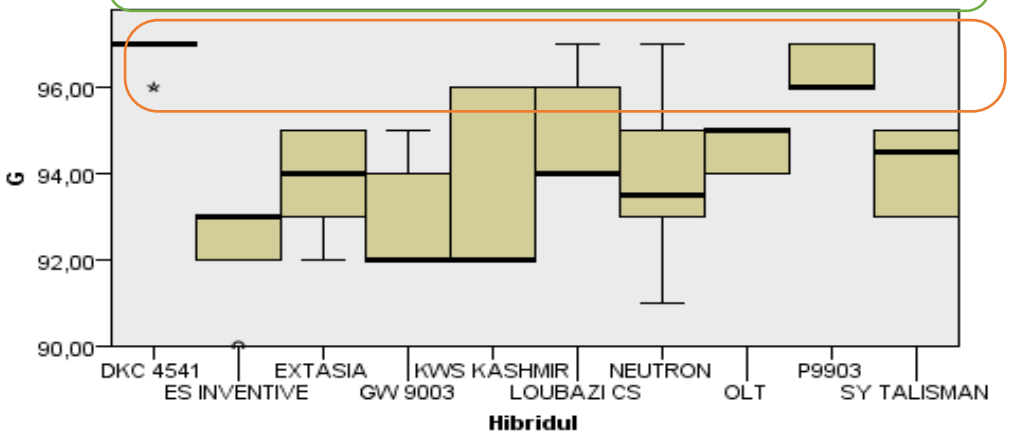

Figure no. 5.72. Application of the Kruskal Wallis test to validate working hypothesis 8 - own contributions

Working hypothesis 9 assumed that the value of the cold test (CT%) complies with the qualitative characteristics of the hybrid seeds obtained. The hypothesis was proved by reducing to nonsense the null hypothesis, namely:

The distribution of the cold-test index is the same for all the analyzed lots. The Kruskal Wallis test was applied, the result of which for the variable CT% generated a statistical significance of more than 99.99% at a test value of 49.45 out of a total of 60 determined values, at a number of 9 degrees of freedom .

The distribution according to the test of independent samples reflects the fact that the normal favorable distribution of optimal CT values is between 91% and 94% with hybrids P9903 and DKC4541 with a higher CT of over 95% but also a number of other 5 hybrids whose CT is lower optimal limit. The decision taken following the application of the Kruskal Wallis test was to reject the null hypothesis

From the analysis and interpretation of the results of the Kruskal Wallis test it resulted that all 9 working hypotheses were valid for the quantitative and qualitative indices determined in the experiments performed.

CONCLUSIONS

The objective of the research was to conduct an experimental study on the opportunity of farmers in Brăila County to establish the optimal production structure that would allow them to decide on the production of corn hybridization lots, so that the farm obtains maximum profit, based on specific indicators of technology and productivity.

The focus of the study was on the use of high-performance agricultural practices, the use of seed material with high genetic potential and the application of cultivation technologies so as to protect the soil and the environment against pollution and excessive degradation.

In the context in which the meteorological conditions are more and more variable, from year to year, without increasing the consumption of water and fertilizers, an important role is played by the seed used to establish crops, which through its biological, physical and physiological qualities can to increase the harvest without having a negative influence on the environment and the health of people.

The production of hybrid maize seeds on specialized farms and on large areas is essential for the agricultural sector, to ensure the need for seeds with high biological value to help increase production without increasing other resources.

Seed production aims to maintain the biological characteristics of varieties and hybrids at the initial level, a level that made that variety or hybrid to be recommended for production. Obtaining quality seeds, maintaining the initial properties of the variety or hybrid is done according to special rules and techniques, according to technologies developed by the research stations that produce the parental forms.

The analysis of the factors that determined the concentration of hybrid seed production in Brăila County highlights some important aspects. First of all, in this area, corn meets the best conditions for development, the climatic factors being favorable to this crop. The maintenance and development of the irrigation infrastructure at the county level is a very important element in seed production.

Against the background of this infrastructure, farmers have equipped themselves with modern irrigation facilities that provide the water needed for crops. The existence of compact land surfaces where insulation distances can be ensured for the seed lots, as well as the performance of works with high-performance equipment, is another advantage of the area. In this context, a number of independent seed conditioning stations have been set up in the area to provide drying and conditioning services.

The study carried out so far shows that there are several options for producing maize hybridization lots on the analyzed lands, each of these lots having different qualitative and quantitative characteristics, being necessary to evaluate the individual and group yields of hybrids to achieve research objectives.

The main research direction of the paper is part of the strategy to increase the role of Romanian agriculture in food security in the country, because agricultural production is the main source for food consumption of the population.

The aim of the paper is to identify the best parental forms of corn hybrids with the greatest adaptability to soil and climatic conditions in the area analyzed, obtaining the best yields on the three sites established, so that the results obtained help farmers in those areas to take cultivation decisions enabling them to produce maize hybridization batches under optimal conditions of technology and production

This research corresponds to the model of sustainable smart agriculture, characterized by the following aspects: ensuring market demand by optimizing product quantities; ensuring the quality of marketed products and maximizing economic profitability

by obtaining maximum economic efficiency in competitive conditions. Being a component of the cultivation technology, the high quality seed obtained is a natural technological element to increase production without affecting the soil and the environment.

To carry out the doctoral thesis, the research was carried out during the years 2017-2019, by determining the qualitative and quantitative indices of seeds in laboratory and field conditions, using standardized working methods established for research and statistical analysis.

Under laboratory conditions, preliminary research was performed, using standardized methods for determining germination and cold-test, by methods in which external conditions were controlled to give the best, fast, accurate and complete germination results.

A complex preliminary analysis was performed on germination and cold-test, for 20 parental forms of hybrid corn, on the influence of two experimental factors, genotype and soil from Vădeni, Unirea and Bărăganu, and in the field the research was conducted during 2018 - 2019, on the land of several commercial companies located in the three areas, from Brăila, Vădeni, Unirea and Bărăganu counties, located on alluvial soils with clay-clay texture, typical chernozem and coarse-textured chernozem. The studies aimed at the interaction of 10 batches of maize hybridization with the main crop factors that influence the degree of pollination of the cob (NMS), the average weight of the cob (GMS), the average production (PM), and for the obtained seeds, the humidity (U%), germination (G%), mass of 1000 grains (MMB) and cold-test (CT), studying the influence of cultivation factors on the main quality indices and establishing the best corn genotypes for the analyzed areas.

In order to establish the results showing the hybrid lots that have the potential to maximize the productive yield and profit as well as the hybridization lots that have a lower economic interest, a number of 10 working hypotheses were set that were analyzed and interpreted graphically.

By applying and interpreting the Kruskal Wallis test, it resulted that all 9 working hypotheses were valid for the quantitative and qualitative indices determined in the experiments performed.

The hybrids DKC 4541 and P9903, which in a number of 5 working hypotheses presented much higher values, above the optimal ones determined by the statistical test, stood out and can be recommended for all three culture areas. Below the calculated optimal limit, 8 of the 9 calculated hypotheses included the hybrids ES Inventive, Neutron, GW 9003 and Sy Talisman that presented sensitivities to different technological conditions and can be recommended on the three areas with certain restrictions.

The other hybrids, Olt, KWS Kashmir, Loubazi CS, Ecstasy, are evaluated according to the study as being of average quality both in terms of production yield and in terms of quality characteristics, and can be recommended to grow in the three areas of culture respecting certain characteristics related to the sowing season of the two parental forms as well as to the application of specific works.

It was considered that an experimental study on the opportunity of farmers in Brăila County to establish the optimal production structure that would allow them to decide on the production of hybridization lots of corn, so that the farm to obtain a maximum profit, based on indicators specific to technology and productivity, is a topical and useful topic for farmers in the area. The results of the study confirmed that following an efficiency and effectiveness study, agricultural producers can significantly improve their economic performance both by increasing production yield and by significantly eliminating the losses resulting from the production process. From an empirical point of view, the research covers the significant aspects regarding the importance and topicality of the option for corn consumption, bringing to attention a technological journey regarding the characteristics of the hybrid seed material. From a practical

point of view, the study is a useful pragmatic assessment of both seed and agricultural producers. The topicality of the study is based on the increase of the share of maize consumption correlated with the qualitative impact of hybridization lots in terms of demand and supply, thus setting a rigorous objective of evaluating the production of hybrid maize seeds, from farms located in Bărăgan Plain correlated with solutions optimization of the productive act. The research showed without a doubt that this optimization process is possible and feasible by indicating a classification of hybridization batches according to their acclimatization capacity to the specific conditions in the analyzed geographical basin on which a SWOT analysis was applied on pedoclimatic criteria.

The author intends to expand the research at a later stage to other hybridization lots with the intention of disseminating the research results to the private sector and helping producers by choosing the best hybrids to effectively improve their economic parameters.

Stoica (Dincă) Cristina - Research on optimizing the production of hybrid maize seeds in agricultural holdings in the Bărăgan Plain - Abstract

LIST OF WORKS, AWARDS, PROJECTS

I. Complete list of works developed and / or published

A. Books published in recognized publishers

Books / guidance (C) and chapters from Books (Cc) with didactic / professional character

A.1.1. **Stoica (Dincă), C**., Băcanu (Serban), C., Stanciu, S., 2018, Producția românească de semințe certificate-evoluție și caracteristici, în „Economia Agroalimentară și dezvoltarea rurală din perspectiva integrării europene", Coordonatori Alexandri C., Gavrilescu, C., Krulizslicika, M., Rusu, M., Editura Academiei Române, București, ISBN 978-973-27-2946-5, pag. 310-320 (11 pag/610 pag).

B. Scientific articles

1. Articles published in ISI listed journals

2. Articles published in Volumes of ISI (Clarivate Analytics) indexed conferences

B.2.1. **Cristina STOICA (DINCĂ),** Iuliana Manuela DUMITRIU (ION), Marius NICULA, Andrei Mirel FLOREA, Alexandru Daniel DINCA, and Silvius STANCIU, "Production of Hybrid Maize Seeds in Braila County. Characteristics and Evolution 2007-2018", Proceedings of the 34rd IBIMA International Conference: Vision 2020: Sustainable Economic Development and Application of Innovation Management from Regional expansion to Global Growth (Madrid, Spain, Nov. 13-14, 2019), pag 3579-3587 , ISBN: 978-0-9998551-3-3https://ibima.org/conference/34th-ibima-conference/)

B.2.2. **Cristina STOICA (DINCĂ),** Iuliana Manuela DUMITRIU (ION), Bogdan Dumitrache BRATOVEANU, Mihaela MUNTEANU PILA, Mihaela Daniela URSAN (DINCĂ), Silvius STANCIU, 2019, Considerations Regarding the Restrictive Factors on the Cultivation of Seed Maize in the North of Bărăgan Plain,, Proceedings of the 34rd IBIMA Conference: Vision 2020: Sustainable Economic Development and Application of Innovation Management from Regional expansion to Global Growth (Madrid, Spain, Nov. 13-14, 2019), pag.: 7064-7071, ISBN: 978-0-9998551-3-3 https://ibima.org/conference/34th-ibima-conference/)

B.2.3. **Stoica (Dinca), C.,** Băcanu (Serban) M. C., Ion (Dumitriu) I.M., Nicula, M., Stanciu, S., 2019, Aspects Regarding the Selection of Maize Hybrids on Agricultural Farms in North Baragan Plain, Romania , Proceedings of the 33rd International Business Information Management Association Conference: Education Excellence and Innovation Management through Vision 2020 (Granada, Spain, April 10-11, 2019), Vol. I-X, pp. 2341-2348, Ed. Soliman, K.S., ISBN: 978-0-9998551-2-6, WOS: 000503988803081,https://apps.webofknowledge.com/full_record.do?product=WOS&search_mode=GeneralSearch&qid=1&SID=D21dCqHJoLxxKQHbxKr&page=1&doc=12.

B.2.4. **Cristina STOICA (DINCĂ)**, Iuliana Manuela DUMITRIU (ION), Mihaela MUNTEANU PILA, Alexandru Daniel DINCĂ, Andrei Mirel FLOREA and Silvius STANCIU, "Plant Protection Products in Romania. Case Study Brăila County" to the International Business Information Management Conference (35th IBIMA) Seville, Spain 1-2 April, 2020 has been accepted for presentation at the conference. The paper will be included in the conference proceedings (ISBN: 978-0-9998551-4-0) as a full paper.Pagina 7528-7535 https://ibima.org/conference/35th-ibima-conference/

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B.2.11. **Stoica (Dinca), C**., Băcanu (Șerban), C., Ion (Dumitriu), I.M., Stanciu, S., 2018, Aspects regarding maize crops in Romania and Braila county, 31st IBIMA Conference: Innovation Management and Education Excellence through Vision 2020 (Milan, Italy, April 25-26, 2018), Ed. Soliman, K.S., ISBN:978-0-9998551-0-2, Vols. I–XI, pp. 5305-5312, WOS: 000444067202154, https://apps.webofknowledge.com/full_record.do?product=WOS&search_mode=GeneralSearch&qid=1&SID=E2UXWnELhrh9PUAUwIc&page=1&doc=41

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B.2.13. **Stoica (Dinca), C**., Băcanu (Serban), C., Ion (Dumitriu), I.M, Stanciu, S., 2017, Romanian certified seed production. Evolution and characteristics in the international context, Proceedings of The 30th International Business-Information-Management-Association Conference: Vision 2020: Sustainable Economic Development, Innovation Management, and Global Growth, (Madrid, Spain, Nov. 08-09, 2017), Ed. Soliman, K.S., Vols I-IX, pp. 3198-3207, WOS:000443640502064, https://apps.webofknowledge.com/full_record.do?product=WOS&search_mode=GeneralSearch&qid=1&SID=E2UXWnELhrh9PUAUwIc&page=2&doc=70.

3. Articles published in journals and in volumes of scientific events indexed in international databases.

B.3.1. **Cristina STOICA DINCĂ**, Iuliana Manuela DUMITRU ION, Dumitrache Bogdan BRATOVEANU, Silvius STANCIU ,,Aspects Regarding Maize Crops in the Southeast Region of Romania,, Annals of “Dunarea de Jos” University of Galati Fascicle I. Economics and Applied Informatics Years XXVI – no2/2020 ISSN-L 1584-0409 ISSN-Online 2344-441X www.eia.feaa.ugal.ro DOI https://doi.org/10.35219/eai15840409115

B.3.2. **Dincă, C**., Băcanu (Serban), C., Ion (Dumitru), I.M., Stanciu, S., 2019, Aspects Regarding The Certified Seed Production In Romania, Research in Agriculture and Agronomy, Vol. 2019 (2019), Article ID 797526, DOI: 10.5171/2019.797526, https://ibimapublishing.com/articles/AGRI/2019/797526.

B.3.3. Băcanu (Șerban), C., **Dincă, C.,** Dumitriu (Ion), I.M., Stanciu, S., 2019, Agricultural Production, Soil Quality and Fertilizer Used in Braila County, Romania, Research in Agriculture and Agronomy, Vol. 2019 (2019), Article ID 970358, DOI: 10.5171/2019.970358, https://ibimapublishing.com/articles/AGRI/2019/970358.

4. Papers presented at international / national conferences with international participation

B.4.1. B.4.1. **Stoica (Dincă), C**., Dumitriu (Ion), I.M., Bratoveanu, B.D., Ursan (Dincă), M.D., Stanciu, S., 2019, Aspecte privind utilizarea produselor de protecție a plantelor în județul Brăila, Sesiunea Ştiinţifică Internaţională Cercetări de Economie Agrară și Dezvoltare Rurală: "Dezvoltarea Durabilă a Agriculturii şi a Spaţiului Rural din Perspectiva Politicii Agricole Comune", Org. Academia Română, Institutul Naţional de Cercetări Economice “Costin C. Kiriţescu”, Institutul de Economie Agrară (București, România, 11. 12. 2019), http://www.eadr.ro.

B.4.2. **Stoica (Dincă), C**., Băcanu (Șerban), C., Dumitriu (Ion), I.M., Stanciu, S., 2019, Research on

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B.4.4. **Stoica (Dincă), C**., Dumitriu (Ion), I.M., Nicula, M., Florea, A.M., Dincă, A.D., Stanciu, S., 2019, Production of Hybrid Maize Seeds in Braila County: Characteristics and Evolution in The Period 2007-2018, Proceedings of the 34th International Business Information Management Association Conference: Vision 2025: Education Excellence and Management of Innovations through Sustainable Economic Competitive Advantage (Madrid, Spain, November 13-14, 2019), Vol. I, pp. 3579-3587, Ed. Soliman, K.S., ISBN: 978-0-9998551-3-3, https://ibima.org/conference/34th-ibima-conference/#ffs-tabbed-15.

B.4.5. Băcanu (Serban) C., **Stoica (Dinca), C.,** Ion (Dumitriu) I.M., Nicula, M., Stanciu,

a. S., 2019, The Influence of Temperature, Precipitation, Irrigation and Varieties on Seed

b. Production in Romania, Brăila County, Proceedings of the 33rd International Business

c. Information Management Association Conference: Education Excellence and Innovation

d. Management through Vision 2020 (Granada, Spain, April 10-11, 2019), Vol. I-X, pp. 2285

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B.4.8. **Stoica (Dincă), C.,** Băcanu (Șerban), C., Ion (Dumitriu), I.M, Nicula, M., Stanciu, S., 2018, Producția semințelor de porumb hibrid în Județul Brăila. Cracteristici și evoluție în perioada 2007-2017, Sesiunea Științifică Internațională Cercetări de Economie Agrară și Dezvoltare Rurală: „Piețele agricole și spațiul rural în contextul modernizării și simplificării politicii agricole comune", Organizatori Academia Română, Institutul Național de Cercetări Economice „Costin C. Kirițescu", Institutul de Economie Agrară (București, România, Decembrie 11, 2018), Secțiunea 1, Exploatația agricolă și managementul resurselor, http://eadr.ro/fisiere/sesiune2018ro.pdf.

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B.4.16. **Stoica (Dinca), C**., Băcanu (Șerban), C., Ion, I.M., Stanciu, S., 2018, Aspects regarding maize crops in Romania and Braila county, 31st IBIMA Conference: Innovation Management and Education Excellence through Vision 2020 (Milan, Italy, 25-26 Aprilie, 2018), http://ibima.org/accepted-paper/aspects-regarding-maize-crops-in-romania-and-braila-county.

B.4.17. **Stoica (Dinca), C**., Băcanu (Șerban), C., Ion, I.M, Stanciu, S., 2018, Considerations on the Production of Hybrid Corn Seeds in Romania, 31st IBIMA Conference: Innovation Management and Education Excellence through Vision 2020 (Milan, Italy, 25-26 Aprilie, 2018), http://ibima.org/accepted-paper/considerations-on-the-production-of-hybrid-corn-seeds-in-romania.

B.4.18. **Dinca, C**., Băcanu (Serban), C., Ion, I.M., Stanciu, S., 2017, Romanian certified seed production. Evolution and characteristics in the international context, The 30th International-Business-Information-Management-Association Conference: Vision 2020: Sustainable Economic Development, Innovation Management, and Global Growth, (Madrid, Spain, Nov. 08-09, 2017), http://ibima.org/conference/30th-ibima-conference/#ffs-tabbed-112.

B.4.19. **Stoica (Dinca), C**., Băcanu (Șerban), C., Stanciu, S., 2017, Producția românească de semințe certificate, The 22 International Confeence "Agrifood Economy and Rural Development in an European Integration Perspective", Organizatori Academia Româna, IEA București, (Bucharest, Romania, December 13, 2017), http://www.eadr.ro/Conferinta%20IEA-AR%2013-dec-2017.pdf.

C. Certificates and awards

Prize awarded by UEFISCDFI, Research Results Awarding Competition, MC 2019, Final Results List 7, PN-III-P1-1.1-PRECISI-2019-34356, https://uefiscdi.gov.ro/premie rea - ultatelor-recherchearii-articole

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Special award from the business environment within the project “Academic excellence and entrepreneurial values - scholarship system to ensure training and development opportunities for entrepreneurial skills of doctoral and postdoctoral students - ANTREPRENORDOC

2018. First Prize CSSD-UDJG, Galați, Romania, June 7-8, 2018

2019. Second Prize -CSSD-UDJG, Galați, Romania, June 13-14

2020. Second and Third Prize - CSSD-UDJG, Galați, Romania June 18-19

D. Postgraduate courses

1. Postgraduate program of training and continuous professional development, "Innovative teaching strategies".
2. Postgraduate program of continuous training, DFCTT, "Management of bibliographic references".
3. Postgraduate program of training and continuous professional development, "Educational mentoring in academia".
4. Postgraduate training and continuing professional development program "Innovative technologies and products in the field of intelligent specialization".
5. Postgraduate training and continuing professional development program "General entrepreneurial skills".
6. Postgraduate training and continuing professional development program "Obtaining, protecting and capitalizing on industrial property rights".
7. Postgraduate training and continuing professional development program "Writing and publishing scientific articles".

E. Projects

1. 2019-2020, Target group member in the project: Excellence, pVII. Projects 1. 2019-2020, Target group member in the project: Excellence, performance and competitiveness in RDI activities at the "Dunărea de Jos" University of Galați ", acronym" EXPERT ", funded by the Ministry of Research and Innovation through Program 1 - National system development of research and development, Subprogram 1.2 - Institutional performance - Projects to finance excellence in RDI, Contract no. 14PFE / 10.17.2018
2. 2019-2020, Target group member in the project: Academic excellence and entrepreneurial values - scholarship system to ensure training opportunities and development of entrepreneurial skills of doctoral and postdoctoral students - ANTREPRENORDOC, co-financed by the European Social Fund through the Human Capital Operational Program, 2014-2020, Contract no. 36355 / 23.05.2019 POCU / 380 / 6/13 - SMIS Code: 123847.
3. 2017, Mobility projects for researchers, PNCDI 2014-2020, Competition 2017, Subprogram 1.1 - Human Resources - Mobility projects for researchers, Contract PNIII-P1-1.1-MC2017-1326, value 15,400 lei, Project Manager Stoica (Dincă) Cristina.

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