

**RESEARCHES CONCERNING THE BEHAVIOR OF SOME MAIZE HYBRIDS**  
**UNDER THE INFLUENCE OF TECHNOLOGICAL LINKS IN THE CONTEXT**  
**OF SUSTAINABLE AGRICULTURE**

**(ABSTRACT)**

**Keywords: maize, hybrids, soil tillage, crop fertilization, grain quality, economic efficiency**

The maize (*Zea mays* L) is one of the most valuable crops, due to high productivity and multiple uses of its products to feed people, in livestock and industry. The importance of maize is given by the following advantages: - present a high production capacity, approximately 50% higher than other cereals; - has a high ecological plasticity; - is a hoeing plant, a good precursor for most of the crops and mechanized 100%; - supports the monoculture; - leaves the field free of weeds; - can be cultivated as a second crop after the plants with early harvest; - requires a small amount of seed for sowing; - good progress schedule of agricultural works; - capitalizes very well the organic and mineral fertilizers and the irrigation water; - various opportunities for production capitalization.

Concerning the application of new cultivation technologies more performance, combined with the positive effects of the phenomenon of heterosis and new maize hybrids, have met the conditions for maize production to record spectacular increase. The growth rate of the average production at maize is also due to use of increasingly higher amounts of chemical fertilizers, the density increase of plants per hectare and not least because performance technology.

The success of establishing of a culture of maize, as well as the getting of some quantitatively and qualitatively stable harvests categorically depend of two aspects: climatic conditions as well as ensuring and full compliance of recommended technological links for the culture area. The technology has the following key links: crops rotation, soil tillage, fertilization of crops, seed and sowing, maintenance and harvesting works of the crop.

For decades, worldwide, national research institutes or private companies continuously invest in research and agricultural development in order to identify the best solutions for maintaining, improving and perfecting the existing agricultural technologies so far. In this sense there is a highly competitive market that provides products, services and quality

recommendations based on the crop, the applied technology, the type of the problem and the culture area.

The maize is cultivated worldwide on about 160 million hectares, the USA remains the leader in respect of the occupied surface with maize grains and the states that make up the EU occupies 43% of the total cultivated worldwide. The production depends very much on developments in climatic conditions. In Romania the harvests are very low considering natural fertility conditions of the soils and the application opportunities of the technological links.

After intensifying the production process in most agricultural crops, the harvests and the quality of them have increased, but occurred unfavorable effects and influences of conventional agriculture on the soil and the environment, namely pollution. Currently there is researches and recommendations to limit and remedy these negative effects.

The theme of researches performed for achieving this PhD thesis has a special importance by agronomic point of view, because had that main purpose determining and recommending of some technological links leading to improving and perfecting the maize cultivation technology. It was investigated how a series of hybrids reacts at different soil tillage methods, on different agrofunds of fertilization as well as the interaction of these factors. Also, was monitored how will behave the maize crop in terms of quality indicators and its economic efficiency.

The developing of PhD thesis has like IT support a vast documentation, from magazines and published specialized books or from online sources (13). The documentation includes 157 titles, from which a considerable part is in foreign languages (English, French). The experience has been placed as part of an experimental platform, at INCDA Fundulea and it was carried out during the years 2012-2014, including three cycles of vegetation of the maize crop.

The PhD thesis carried out over 9 chapters, covered 240 pages that contain 133 tables, 97 figures and 11 photography.

In the first chapter of the thesis are presented data from the specialized literature regarding the importance of maize crop in terms of origin and its spreading, of the agrobiologic particularities, the areas and production at national and global level.

The maize cultivation technology is treated in detail in Chapter II. Here, is also present a series of trends and news, on application in the maize technology of some improved technological links designed to improve established technologies.

Chapter III refers to current state of researches in the country and abroad regarding the behavior of maize under the influence of technology. These researches include aspects of the most varied related to the cultivation technology until the real and effective exploitation of genetic and pedoclimatic resources of maize.

The pedoclimatic conditions of testing are presented in Chapter IV. The research centre (NARDI Fundulea) is located in the Romanian Plain, on an uniform field from the point of view of fertility and microrelief, on a soil which fall with in the class of the chernozems characterized by a high content of nitrogen and total phosphorus. This chapter also contains data about relief, geomorphology și lithology, hydrology and hydrogeology. From a climatic point of view, the area where the experiments were conducted, is characterized by a form of transition from steppe climate to forest steppe climate, this is framed in temperate continental climate. Also in this chapter are analyzed atmospheric precipitations and average air temperature, registered for the research period and in conjunction with their method in the past 40 years. Changes in pedoclimatic issues directly potentiated the effect of technological links studied on maize crop *in terms of quantity and quality*. So it was highlighted climatic characteristics of the experimental years, namely: 2012 agricultural year was unfavorable, 2013 and 2014 agricultural years was favorable.

Chapter V contains information on the experimentation methodology, agrophytotechnical measures applied to maize crop and a series of photo aspects from the experimentation period. The experimental module was of trifactorial type, ordered after the subdivided parcels method in three repetitions. The total area of the experience was 7056 m<sup>2</sup>. The total area of an experimental plot was 84 m<sup>2</sup>, and harvested area was 56 m<sup>2</sup>. The experimental data were statistically analyzed after the method of variance analysis.

The factors studied are: - A. basic soil work; - B. nitrogen and phosphorus fertilization; - C. studied hybrid. The graduations of the factors included in the study are:

*A. basic soil work*

- a1 - autumn plowing – 25 cm
- a2 - spring plowing – 18-20 cm
- a3 - loose with chisel at 35 cm + disking at 15 cm

*B. nitrogen and phosphorus fertilization*

- b1 - unfertilized (N<sub>0</sub>P<sub>0</sub>)
- b2 - fertilization with N<sub>120</sub>P<sub>70</sub>

*C. studied hybrid*

c1 - Partizan

c2 - Crișana

c3 - Mostiștea

In the experiment was used a biological material consisting of three maize hybrids, which are part of the genetic creations from NARDI Fundulea. The main objectives of the researches:

- the influence of soil tillage methods on production at maize crop;
- the influence of soil tillage methods on quality indexes at maize crop;
- the influence of fertilization with NP on production at maize crop;
- the influence of fertilization with NP on quality indexes at maize crop;
- the associated influence of soil tillage methods, fertilization with NP and the hybrids on production at maize crop;
- recommendations regarding the influence of technological links for maize crop in terms of quantity, quality and economic.

Chapters VI and VII are intended for experimental results obtained for each year individually and average for 2012-2014. The results of each year of experimentation ends with a summary and conclusions regarding the influence of studied factors on production, quality and economic efficiency at maize. The scientific result, obtained in years with different climatic events, in conjunction with technological links studied, provides the premises of some viable recommendations for maize crop. Following these experimental results is possible the implementation of recommendations in areas with similar pedoclimatic conditions with those from the area where experimental area is.

The economic calculations are presented in Chapter VIII and highlight the best technological variants from those tested, at maize crop.

In Chapter IX presents the final conclusions and recommendations drafted after the analysis of the experimental data obtained in 2012-2014. Thus, by knowing the relationships and influences between culture plant and technological factors, the developing and the implementation of the right technology strategies can lead to favorable results on its production and quality, on soil and environment, with significant economic results.

The conclusions and recommendations highlighted the same variants, in all experimental years, whatever the climatic characteristics: favorable or unfavorable. It follows that the production and its quality depends on the technological links applied and pedoclimatic

conditions. Thus, it was demonstrated that for conditions from INCDA Fundulea as well as for areas with similar characteristics, the recommendation is :

- for years with favorable climate: application of variant technological with autumn plowing like the basic soil tillage / fertilization culture with  $N_{120}P_{70}$  / use Mostiștea or Crisana hybrids.
- for years with unfavorable climatic (drought or uneven distribution of rainfall during the growing season) by applying technological variant: chisel + disking like the basic soil tillage / fertilization culture with  $N_{120}P_{70}$  / use Mostiștea or Crisana hybrids.

The PhD thesis ends with the used bibliography for chapters that required citing of authors, who have contributed over time at increasing knowledge in the field of agronomy.