# SUMMARY

Thanks to the importance of ploughings, during the production processes in agriculture, an important and special role is awarded to scientific research, which must establish the most adequate ploughing units, from the technical and economic point of view.

Ploughs, which are very used units, and that have been thoroughly studied and known at an international as well as national level, have reached a high technical stage, and the essential changes of the nowadays functional and constructive principles are very hard to carry out.

So, each element that can provide even a small improvement in the quality of ploughings, an increase in labour productivity, a decrease in the direct expenditures per hectare or in fuel and metal consumption, have an important role upon the increase of economic efficiency.

Thus, research and experiments have been performed in order to establish the most adequate types of ploughs, which will work in aggregate with the 65 HP tractors.

The main research criteria consist, on the one hand, of reaching the imposed agri-technical demands, and on the other hand, of presenting a rational usage of the energetic base.

Making the soil basic work, as ploughing is known, is in a direct connection with the soil type, which from the point of view of agriculture mechanization has various characteristics, both due to different mechanic features and variations of humidity and soil compaction.

The present paper, aims at establishing the optimal type of plough, in order to be able to perform some superficial and normal ploughings, which will

work in aggregate with the 65 HP tractor, within the current framework provided by the conditions of tending and use.

The research carried out during 1997-2000 took into consideration and focussed on the following objectives: study of the types of ploughs used for superficial ploughings (at a depth of 15-20 cm) in aggregate with 65 HP tractors, study of the types of ploughs used for normal ploughings (at a depth of 20-25 cm) in aggregate with 65 HP tractors, some technical and economic analyses of ploughs.

Two types of ploughs: PP-3-30 plough and the reversible plough PRP-3 have been used during the experimental period.

The trials were performed on three different types of soil (easy soil, medium soil and hard soil) and we have used four different working speeds (4.48 km/h, 4.61 km/h, 4.85 km/h and 4.98 km/h).

The research was hosted by the experimental plots owned by the Agricultural Research and Development Station Podu-Iloaie, Iasi county.

The studies focused on determinations regarding ploughings' qualitative indexes, exploitation indexes and also energetic indexes of ploughings units.

Taking into account its objectives fulfilled in field experiments, its results and content, the theme of this doctorate thesis joins those important themes of actuality with high applicability in improving the ploughing and in obtaining good fields which account for considerable increase in yields and decrease in the costs per hectare.

The paper was drafted according to a judicious plan rationally structured into 8 chapters, excepting the introduction and conclusion chapter.

The first four chapters have a general character and the last four chapters (5-8) deal with the study of plough type and with the aspects related to personal experiments.

The results of the experiments have been carefully analysed and interpreted and in doing so we have kept in mind the significance of the differences among the variants under study.

The field trials and all the works and observations during the period were carried out respecting the requests and demands of the experimental technique.

The first chapter deals with soil as the environment for plant growth and development, and it presents general considerations about soil, physical features of the soil (texture, structure, density, bulk density and porosity), physic-mechanic features of the soil (plasticity, compaction, consistency, volume variation, soil resistance at working, physical maturity, etc.).

The second chapter of the thesis presents interesting information and conclusions regarding soil works and systems of working. A parallel is also drawn between two types of soil work systems: the tillage system (conventional one) and the no-tillage system.

The third chapter deals with the basic soil work, namely ploughing. It depicts the importance of this work, the agri-technical demands, the conditions which determine the ploughing quality, ploughing classification, how to prepare the terrain for ploughing and some methods used for performing the basic work of the soil.

The fourth chapter presents the ploughing quality indexes (époque, the average of ploughing depth, the average of working width, the degree of incorporation of the vegetal mass and fertilizers, soil breaking up degree, loosening degree), exploitation indexes of the ploughing unit (usage ratio of working time per tractor, usage ratio of all working times, working capacity: theoretical, real and general, fuel consumption on working unit) and energetic indexes of the ploughing unit (specific fuel consumption, resistance force, traction power, etc.).

In the fifth chapter the natural conditions of the region that provided for the framework in which the experiments were carried out are characterized with reference to the geographical location, geomorphology, hydrology, climate, rainfall regime and soils. The evolution of the research span is presented and commented upon in tables and graphics.

The sixth chapter presents aspects related to the research objectives, the methodology of the experiments, the soils on which these experiments were carried out, the types of ploughs used and some devices used in experiments such as: the device for measuring and recording the resistance force, device for time measurement, device for measuring the fuel consumption.

The seventh chapter represents an important part in the content of the thesis for it presents and comments upon the results of the field experiments carried out during 1997-2000 regarding the establishment of the optimal type of plough used for superficial ploughings (at a depth of 15-20 cm). We used two types of ploughs (a normal one PP-3-30 and a reversible one PRP-3) both of them working in aggregate with a 65 HP tractor. The experiments were carried out on three different types of soil:

- ✓ an easy soil with specific resistance at ploughing of 0.35 daN/cm$^2$;
- ✓ a medium soil with specific resistance at ploughing of 0.35-0.55 daN/cm$^2$;
- ✓ a hard soil with specific resistance at ploughing of 0.56-0.75 daN/cm$^2$.

The working speeds, used during experiments were 4.48 km/h, 4.61 km/h, 4.85 km/h and 4.98 km/h all of them from the II H gear.

As a result of a contrastive parallel study of the two types of ploughs on all the three types of soil and with all four working speeds we can conclude that the best results in terms of performing superficial ploughing were obtained by the PRP-3 plough.

All the indexes studied (ploughing average depth, average working width, degree of soil breaking up, degree of incorporation of the vegetal mass and fertilizers, loosening degree, hourly fuel consumption, traction resistance, specific fuel consumption, working capacity per hour and fuel consumption per hectare) had better values, when we used the ploughing aggregate made up of the 65 HP tractor with the PRP-3 reversible plough in comparison with the unit formed by the 65 HP tractor and the PP-3-30 plough.

The eighth chapter deals with the results obtained with a view to establishing the right type of plough that must be used for normal ploughings (at a depth of 20-25 cm). We experimented on the same types of soils, using the same working speeds and the same types of ploughs as in the tests performed for superficial ploughing, the difference being that we carried out our trials at a depth of 20-25 cm (25 cm to be more precisely), instead of 15-20 cm.

Like in the previous experiments the studied indexes (ploughing average depth, average working width, degree of soil breaking up, degree of incorporation of the vegetal mass and fertilizers, loosening degree, hourly fuel consumption, traction resistance, specific fuel consumption, working capacity per hour and fuel consumption per hectare) had better values, on we use the ploughing aggregate formed by the 65 HP tractor with the PRP-3 reversible plough in comparison with the unit formed by the 65 HP tractor and the PP-3-30 plough.

Therefore, after having studied the two types of ploughs on all the three types of soils, with all four working speeds, we can conclude that the best results for carrying out the normal ploughing system (at a depth of 20-25 cm) were obtained by the PRP-3 plough.

The results have been interpreted by means of taking into account the significance of the differences between the variants taken into consideration and study, at the same time paying attention to the fact that the interpretations should be as accurate as possible.

The conclusions presented in the final part of the paper point out the results with theoretical value and well-marked applicability in using different types of ploughs on different types of soils in the Central Moldavian Plateau, without exaggerating the extrapolation of the results validity to other pedo-climatic zones and other types of soils.

The doctorate thesis has a number of 329 pages with 134 tables and 142 figures. The number of references are 218 from which 85 belong to the foreign technical literature.