

**CRAIOVA UNIVERSITY**  
**DOCTORAL SCHOOL ENGINEERING OF PLANT AND ANIMAL**  
**RESOURCES**  
**AGRONOMY AREA**

# **PHD THESIS**

**(SUMMARY OF Ph.D.THESIS)**

**RESEARCH ON INCREASING THE YIELD AND QUALITY OF  
TEMPORARY GRASSLANDS THROUGH ALFALFA CULTURE IN A  
MIXTURE WITH PERENNIAL GRAMINEE, IN THE CENTRAL AREA  
OF OLTENIA**

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## ABSTRACT

The research conducted was entirely based on the results obtained previously both from the experimental area but also at national level, regarding the mixtures of legumes and perennial forage grasses, for the establishment of temporary meadows.

In this paper, I have endeavored to make available to all interested, a rich scientific material, with the hope of its usefulness in increasing the yield and quality of temporary meadows, with serious implications for a modern livestock sector.

Consequently, it is also hoped to increase the number of livestock to ensure full domestic consumption of animal products and to create significant export availability.

This desideratum determines the increase of the cultivated areas with fodder plants by at least 20% (approximately 2 million hectares) and a corresponding revaluation of the meadows.

Through the research topic approached, several aspects were studied as follows:

- the effect of organic and mineral fertilization on productivity and quality in the temporary meadow consisting of alfalfa and perennial grasses grown on luvisoil from ADRS Simnic;
- research regarding the sowing method for the establishment of temporary meadows on the luvisoil in the central area of Oltenia;
- study of some varieties of alfalfa cultivated in mixture with perennial forage grasses on the luvisoil from the central area of Oltenia in order to obtain a balanced fodder from the point of view of energy-protein.

In the period 2018-2020, at ADRS Şimnic, the following experiences were located:

Experiment 1: The effect of organic and mineral fertilization on productivity and quality in the temporary meadow consisting of alfalfa and perennial grasses on the luvisoil from ADRS Şimnic

The experience was established in the spring of 2017, on a flat plot within the Şimnic Agricultural Development Research Station - Craiova.

The experience placement system was in plots subdivided into three factors, into four repetitions:

Factor A - organic fertilization, with graduations:

a<sub>1</sub>- without manure;

a<sub>2</sub> - manure 30t / ha.

Factor B - phosphorus and potassium fertilization, with graduations:

b<sub>1</sub> – P<sub>0</sub>;

b<sub>2</sub> - P<sub>50</sub>;

b<sub>3</sub> - P<sub>100</sub>;

b<sub>4</sub> - P<sub>100</sub>K<sub>50</sub>.

Factor C - nitrogen fertilization, with graduations:

c<sub>1</sub> - N<sub>0</sub>;

c<sub>2</sub> - N<sub>75</sub>;

c<sub>3</sub> - N<sub>150</sub>;

c<sub>4</sub> - N<sub>225</sub>.

The dimensions of a plot were: 6 m length, 4 m width, 24 m<sup>2</sup> total area and the area harvested after performing frontal and lateral eliminations was 15 m<sup>2</sup>.

The well-shredded manure, respectively the fertilizers with phosphorus and potassium were applied in autumn by manual spreading being incorporated under the basic work of the soil.

In the spring of 2017, approximately 2 days before sowing, the germination bed was prepared using the disc in the unit with the harrow with adjustable fangs, the last work with the combinator.

Sowing was conducted mechanically using SUP-29, with 2.5 cm between rows, on March 14, after previously making the calculations on the seed requirement for each species present in the mixture according to the percentage of participation, as follows:

- For alfalfa (*Medicago sativa*), at the percentage of participation of 50% in the mixture, was used the amount of kg / ha of useful seed, the variety being Adonis.

- For cock's-foot (*Dactylis glomerata*), in the process of participation in the 40% mixture, was used the amount of 10 kg / ha of useful seed, the variety being Olimp,

- For english ryegrass (*Lolium perene*), at the percentage of participation of 10% in the mixture, was used the amount of 3 Kg / ha useful seed was used, the variety being Mara.

In the first year of vegetation, two crops were taken to standardize the vegetation and control weeds, which totaled 10 t / ha m.v. which was not introduced in the statistical calculation, but only in the one of economic efficiency.

The experience was harvested in hay, using the mower.

After the mechanical mowing of the lateral and frontal eliminations that could have influenced the results of the experiments, at the harvest, average samples of 2 Kg m.v. from each plot for the determination of the dry matter respectively for performing chemical

laboratory analyzes. The data obtained were capitalized in 2018, 2019 and 2020 by calculating the analysis of variance with 3 factors.

In the complex of measures regarding the establishment, maintenance and use of temporary (sown) meadows, fertilization is the essential factor in order to obtain a large harvest, constant and for as long as possible.

Particular attention was paid to the enrichment of luviosoil in the research area in organic matter corroborated with adequate mineral fertilization - so that at the application of 30 t / ha manure was obtained on average over the three years of experimentation an increase of 1.8 t / ha su distinctly significant compared to the situation in which the organic factor was not present.

Phosphorus fertilization with a dose of  $P_{50}$  applied under the basic labor, led to obtaining fodder crops of over 8.0 t / ha s.u. and if we refer to our research, the increase brought by it exceeded 2.3 t / ha compared to the situation of non-administration.

The low yield increase due to the presence of phosphorus fertilizers is due to the fact that the luviosoil on which the research was carried out is poor in this macroelement and therefore the intervention with this macroelement is welcome.

Taking into account the experimental results obtained and presented, we appreciate that the intervention with potassium fertilizers on luvosol from ADRS Şimnic is not necessary as it is relatively well supplied with potassium.

If we refer to the optimal dose of nitrogen fertilization of the mixture of alfalfa and perennial grasses for the establishment of temporary meadows on the luvosol in the research area, we can consider it as indicated that of  $N_{150}$  which on average over the three years of experimentation gave a spor of 6.3 t / ha su compared to the witness considered.

Mixtures of legumes and perennial forage grasses have much lower requirements than pure perennial grass crops.

To ensure optimum for plants with nitrates and therefore to obtain a increase yield and good quality crops, fertilization with nitrogen fertilizers is very necessary.

Gravimetric analyzes showed that both nitrogen and manure applied greatly favored perennial grasses to the detriment of legumes, so that in the 3rd year of operation (2020) grasses accounted for 78-93% of the land without manure and 87 - 99% for organic contribution.

Experiment 2: Research on the sowing method for the establishment of temporary meadows on the luvisoil in the central area of Oltenia.

The experience was located in the spring of 2017, on the plateau of ADRS Șimnic-Craiova.

The experience placement system was in single-factor randomized blocks with four repetitions.

Factor A- sowing method with graduations:

a<sub>1</sub>- mechanical mixture: alfalfa 50% (11 kg / ha s.u.) + cock's-foot 50% (14 kg / ha s.u.). Total 25 kg / ha useful seed;

a<sub>2</sub>- a row of alfalfa, a row of cock's-foot. Total: 25 kg / ha useful seed.

a<sub>3</sub>- two rows of alfalfa, two rows of cock's-foot. Total 25 kg / ha useful seed.

a<sub>4</sub>- two rows of alfalfa, one row of cock's-foot. Total 25 kg / ha useful seed.

a<sub>5</sub>-cross sowing of the two components (alfalfa sown in one direction, the cock's-foot perpendicular to the rows of alfalfa). Total 25 kg / ha useful seed.

a<sub>6</sub>-seeded alfalfa and cock's-foot in alternating strips.

The dimensions of plot were: length 6m, width 4m, total area 24 m<sup>2</sup> and harvestable area 15 m<sup>2</sup>.

Phosphorus and potassium fertilizers (agrofond) were applied in the autumn of the previous year, by manual spreading, being then incorporated under the basic labor. The fertilization system was P<sub>50</sub>K<sub>50</sub>.

In the spring of 2017, shortly time before sowing, we started to prepare the germination bed using the disc in the unit with the harrow with adjustable fangs, the last work being with the combinator. At the same time, a dose of N<sub>150</sub> nitrogen divided into stitches was administered.

The sowing was conducted on March 15, 2017, after a preliminary test at the seed drill in stationary, using a total amount of seed of 25 kg / ha of which: 11 kg / ha alfalfa seed and 14 kg / ha cock's-foot seed.

The first year of vegetation, two biomass yields were taken to standardize the vegetation and control weeds that totaled 10t / ha m.v. which were not introduced in the statistical calculation, but only in the one of economic efficiency.

The experience was harvested in hay, using the mower.

The experimental results obtained were capitalized in the period 2018-2020, using the calculation of the analysis of variance.

After mechanical mowing of the frontal eliminations and laboratory, average samples of 2 kg were taken at harvest. m.v. of each plot for the determination of the dry matter.

From the research conducted on average over the three years of experimentation, regarding the sowing method, we can appreciate that the mechanical sowing of the two components (alfalfa and cock's-foot) after being homogenized is the most appropriate way.

Thus, if the variant considered as a control, the harvest was 10.9 t / ha s.u. on average for 3 years, in the other situations followed, the level of yield was very close with insignificant increases, sometimes even significantly negative, as is the case of the last two methods.

Experiment 3: Productivity of alfalfa varieties in pure culture and mixed with perennial grasses on the luvisoil in the central area of Oltenia

The experiment was set up in the spring of 2017 on the plateau of the ADRS Șimnic-Craiova, the plots being randomized and placed according to the block method in four replications as follows:

The dimensions of plot were: length 6 m, width 4 m. The total area of plot being 24 m<sup>2</sup> while the harvestable area, after the front and side eliminations was 15 m<sup>2</sup>.

The preparation of the germination bed was done in the spring of 2017, using the disc in the unit with the harrow with adjustable fangs, the last work with the combinator. The P<sub>2</sub>O<sub>5</sub>-50kg / ha system was used as agrofond.

Sowing was performed mechanically using SUP 29 at 125 cm between rows, after previously making the calculations on the seed requirement for each species present in the mixture, according to the percentage of participation.

The annual dose of nitrogen was N<sub>150</sub> divided into mowing.

In the first year of vegetation, two crops were taken to standardize the vegetation and control weeds that totaled 10t / ha m.v. which was not introduced in the statistical calculation, but only in the one of economic efficiency.

The experience was capitalized on hay, using the mower.

After the mechanical mowing of the lateral and frontal eliminations, which could have influenced the experimental results, at harvest list average samples of 2 kg m.v. from each variant-repetition to determine the dry matter.

On average over the three years of experimentation the best results were obtained in the case of alfalfa varieties Daniela, Magnat and Sandra both in pure culture but especially in the culture of mixture with perennial grasses (*Dactylis glomerata* and

*Lolium perenne*), when the increases of yields were 2.7-2.8 t / ha su compared to the considered control variants.

Referring to the average by varieties (7 t / ha s.u.) compared to the average by mixtures (9.8 t / ha s.u.) we cannot fail to highlight the supe

