COMPARATIVE RESEARCHES CONCERNING THE FERTILISATION EFFECT ON THE YIELD OF A ABANDONED AGRICULTURAL LAND GRASSLAND AND A PERMANENT GRASSLAND FROM GRĂDINARI (CARAŞ SEVERIN COUNTY)

CERCETĂRI COMPARATIVE PRIVIND EFECTUL FERTILIZĂRII ASUPRA PRODUCȚIEI UNEI PAJIŞTI DE PÂRLOAGĂ ŞI A UNEI PAJIŞTI PERMANENTE DE LA GRĂDINARI (JUDEȚUL CARAŞ - SEVERIN)

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Abstract: *In Grădinari (Caraş Severin County) grasslands are representing about 33 % from the total agricultural land of the locality being important natural resource from this point of view, they being the topic of this research. Some of the grassland surfaces are coming from the abandoned agricultural land. One of the most important maintenance works needed in grasslands is represented by fertilisation. Every type of grasslands has different fertilisation needs, so the importance of this research is to set the optimal fertilisation rate with for different types of fertilising (chemical, organic and mixed). The purpose of this work is to find the optimal fertiliser rate for the grassland from Grădinari. The experimental plots were set in Grădinari (Caraş-Severin County), in 2004. The experimental plots comprise three fertilisation experiences: organic, chemical and mixed. Every fertilisation experience is organized in ten variants and five replicates. These were set after the blocks method. The surface of one plot is 20 m^2 (4m x 5m). The data were collected during 2004-2007 period. Thus, there was measured the total yield of fresh fodder and hay for every fertilisation variant from the abandoned arable land grassland and from the permanent grassland. After the analysis of the production results obtained can be noticed that the fertilisation of an abandoned agricultural land that is in succession to the grassland vegetation, the effect of the fertilisers is most powerful from the point of view of the yield starting with the second year from the fertiliser application. In comparison with the abandoned agricultural land in succession, the permanent grassland is visibly influenced by fertilisation starting with the first year from the fertiliser application.*

Rezumat: *În Grădinari (județul Caraş-Severin) pajiştile reprezintă circa 33 % din totalul terenului agricol al localității fiind o resursă naturală importantă din acest punct de vedere, acestea fiind subiectul acestei cercetări. Unele dintre suprafețele de pajişte provin din teren agricol abandonat. Una dintre cele mai importante lucrări de întreținere necesare în pajişte este reprezentată de fertilizare. Fiecare tip de pajişte are cerințe diferite de fertilizare, astfel importanța acestui studiu este să stabilească doza optimă de îngrăşăminte pentru diferite tipuri de fertilizare (chimică, organică şi mixtă). Scopul acestei lucrări este să stabilească doza oprimă de fertilizare pentru pajiştea de la Grădinari. Câmpul experimental a fost înființat în localitatea Grădinari (județul Caraş-Severin) în anul 2004. câmpul experimental cuprinde trei experiențe de fertilizare: organică, chimică şi mixtă. Fiecare experiență de fertilizare este organizată pe 10 variante şi cinci repetiții. Acestea au fost aşezate după metoda blocurilor. Suprafața unei parcele este de 20 m^2 (4m x x5m). Datele au fost colectate de-a lungul perioadei anilor 2004-2007. Astfel, s-a determinat producția totală de masă verde şi de fân pentru fiecare variantă de fertilizare de pe pajiştea de pe terenul arabil abandonat şi de pe pajiştea permanentă. După analiza rezultatelor de producție obținute se poate remarca că la fertilizarea unui teren agricol abandonat care este în succesiune către vegetația de pajişte, efectul îngrăşămintelor este mult mai puternic din punct de vedere al producției începând din al doilea an de la aplicarea îngrăşămintelor. În comparație cu terenul agricol abandonat în succesiune, pajiştea permanentă este vizibil influențată de fertilizare începând cu primul an de la aplicarea îngrăşămintelor.*

Key words: *grassland, fertilisation, permanent grassland, abandoned agricultural land.*
Cuvinte cheie: *pajişte, fertilizare, pajişte permanentă, teren agricol abandonat.*

INTRODUCTION

The surface occupied by the hill and plateau grasslands is about a half from the total surface covered with grasslands. In this surface are included too the eroded land that where before covered with vegetation. On the easy slopes and flat lands are placed valuable grasslands and the dominant grass is *Agrostis tenuis*, this being replaced by *Botriochloa ischaemum* and *Agropyron intermedium* on the eroded land surfaces. These grasslands are grazed early in spring and then the animals are going up into the mountains, the next harvest being valorised as hay. In autumn these surfaces are grazed again. The formations of *Festuca rupicola* are placed on greater slopes with southern exposure, there being found mesophytic species as *Poa pratensis, Festuca pratensis* or *Dactylis glomerata.* Their yields vary among 5 - 10 t/ha fresh fodder. Through fertilisation they can obtain great yield increases (150 %) but the forage obtained has low quality. The *Agrostis tenuis* formation has the greatest spreading at the level of the durmast, oak and beech forests representing the most of the hill grasslands. In moderate ecological conditions there are found different species most of them being mesophytic as are: *Festuca pratensis, Cynosurus cristatus, Phleum pratense* and leguminous as *Trifolium pratense, Medicago falcata* or species from other botanical families as *Chrysanthemum leucanthemum, Achillea millefolium*. Sometimes there can appear shrubs that are diminishing the surface covered with grass. The fresh fodder yields are among 5 – 8 t/ha and most of these surfaces are used in mixed system, respectively they are grazed in spring and autumn and are mowed in summer. The use of the organic fertilizers have maxim efficiency, the main method used being the fencing of small surfaces where the animals are remaining during the night. The lack of these *Agrostis* grasslands is the irregular repartition of the yield, so the first harvest represents about 70 % from the total yield, because the dominant species has a low recovering rate during the year. Because of that is recommended first to harvest the hay and then to graze (PUŞCARU-SOROCEANU *et al.*, 1963).

Having in view the low level of the yields of the permanent grasslands there is necessary to apply a complex of technical and management measures for the improvement of the quality of the forage and its rational use. Depending by that the vegetation can be changed fundamentally in the sense of the improvement or depreciation of the botanical composition in a short time period (MOISUC, 1991).

MATERIALS AND METHODS

There were set two experimental fields with fertilization in Grădinari (Caraş-Severin County), and the data were collected during 2004-2007 period. One of the experimental field is placed in a grassland resulted from abandoned agricultural land ant the other is in a permanent grassland.

Every fertilization experience is organized in ten variants and five replicates. These were set after the blocks method. The surface of a plot is 20 m^2 (4 m x 5 m). The fertilizer doses per hectare used in experiences are next:

1. Control
2. 20 t manure
3. 40 t manure
4. 60 t manure
5. 20 t manure + P_{50}
6. 20 t manure + P_{50} + K_{50}
7. 20 t manure + N_{50} + P_{50} + K_{50}

8. $N_{100} + P_{50} + K_{50}$
9. $N_{150} + P_{50} + K_{50}$
10. $N_{150+100} + P_{50} + K_{50}$

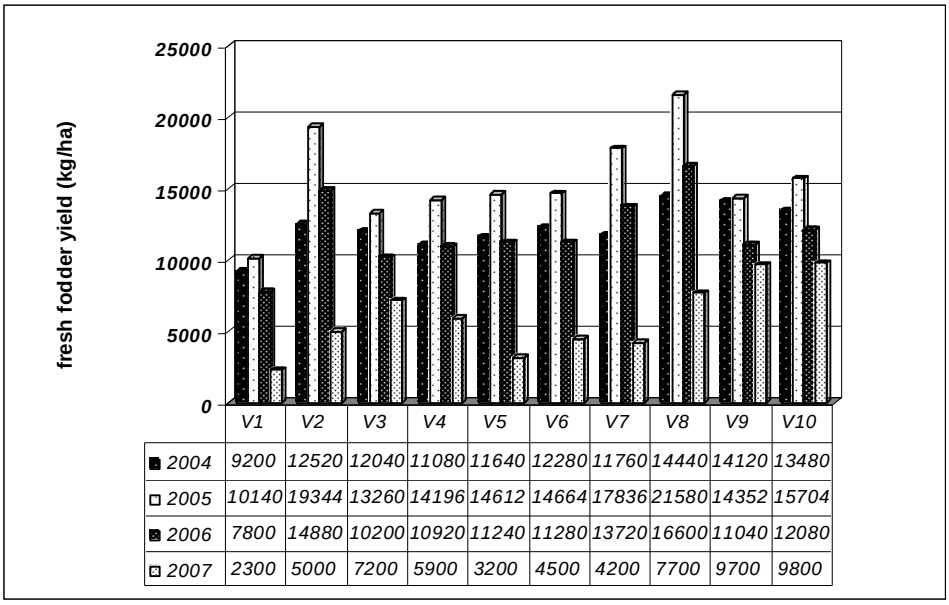
For yield determination there is used direct method realized through repeated cuttings of the green mass. There is determined the total yield of fresh fodder and hay.

RESULTS AND DISCUSSIONS

Fertilization represents an important maintenance work necessary for the increase of the yield of the permanent grasslands. In this way there was determined the total yield of green mass and hay for every fertilization variant from the abandoned arable land and the permanent grassland.

The green mass (kg/ha) from the abandoned arable land in succession is greater in 2005 in the variant fertilized with $N_{100} + P_{50} + K_{50}$ (21,580 kg/ha) and 20 t/ha manure (19,344 kg/ha) (figure 1). As is shown in figure 1, in the first year of fertilization on the abandoned arable land the green mass yields doesn't has important increases, but in the following years there are registered yield decreases culminating with the year 2007 when was harvested only one cut. These decreases are due to the unfavorable climatic conditions.

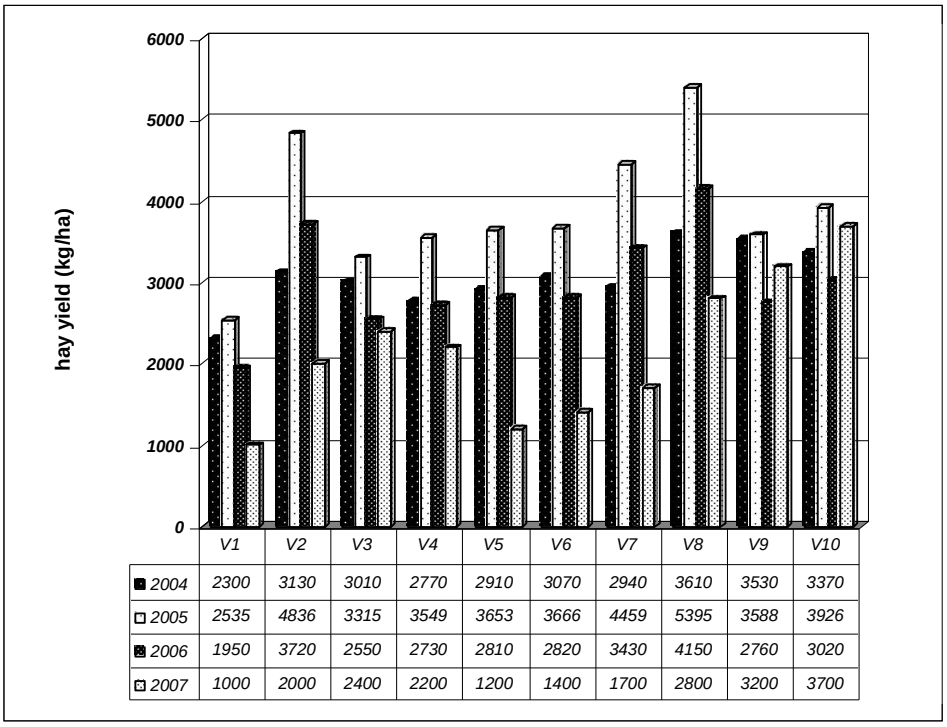
Thus, when an arable land is abandoned and let to be developed as grassland through succession, the greater yield increases are registered in the second year from the applying of the fertilisers.



	V1	V2	V3	V4	V5	V6	V7	V8	V9	V10
2004	9200	12520	12040	11080	11640	12280	11760	14440	14120	13480
2005	10140	19344	13260	14196	14612	14664	17836	21580	14352	15704
2006	7800	14880	10200	10920	11240	11280	13720	16600	11040	12080
2007	2300	5000	7200	5900	3200	4500	4200	7700	9700	9800

Figure1. The green mass yield (arable)

After the analysis of the hay yield (figure 2) can be noticed the same trend as in the case of the green mass excepting the variant fertilized with $N_{150+100} + P_{50} + K_{50}$ when the yield is 3700 kg/ha is slightly higher then in the first experimental year at the same variant (3370 kg/ha).



	V1	V2	V3	V4	V5	V6	V7	V8	V9	V10
2004	2300	3130	3010	2770	2910	3070	2940	3610	3530	3370
2005	2535	4836	3315	3549	3653	3666	4459	5395	3588	3926
2006	1950	3720	2550	2730	2810	2820	3430	4150	2760	3020
2007	1000	2000	2400	2200	1200	1400	1700	2800	3200	3700

Figure 2. The hay yield (arable)

Thus, the greatest hay yields were obtained from the variants fertilized with $N_{100} + P_{50} + K_{50}$ (5395 kg/ha) and 20 t/ha manure (4836 kg/ha) in 2005.

The green mass yield from the permanent grassland shows important increases starting with the first year from the application of the fertilizers.

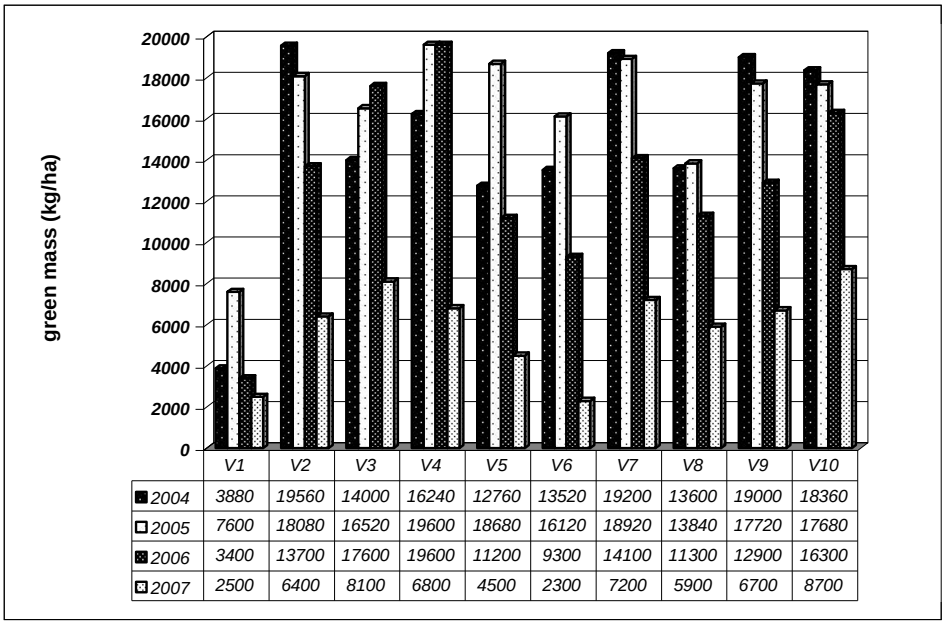
The most important yield of green mass was obtained on the variant where were applied 20 t/ha manure (19,560 kg/ha) (figure 3).

As can be noticed there were realized important increases of the green mass yield in comparison with the unfertilized control. As in the case of the abandoned arable land transformed in grassland, there can be noticed the powerful decrease of the yield in 2007 because of the climatic conditions that haven't allowed the recovery of the vegetation after the first cut.

Analyzing the hay yield (figure 4) can be noticed the same trend as in the case of the green mass yield.

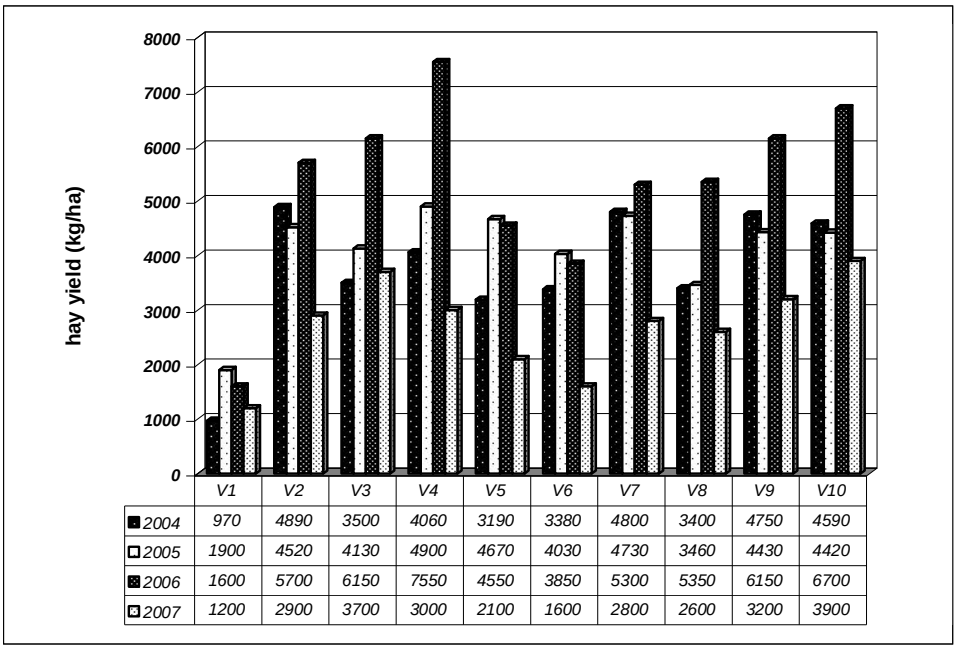
Thus, the greater hay yields were obtained in 2006, the best result being determined on the variant fertilized with 60 t/ha manure (7550 kg/ha) as is shown in figure 4.

After the analysis of the production data obtained they have noticed that the fertilization of an abandoned agricultural land in succession to the grassland vegetation, the effect of the fertilizers applying is more powerful from the point of view of the yield starting with the second year after fertilization.



	V1	V2	V3	V4	V5	V6	V7	V8	V9	V10
2004	3880	19560	14000	16240	12760	13520	19200	13600	19000	18360
2005	7600	18080	16520	19600	18680	16120	18920	13840	17720	17680
2006	3400	13700	17600	19600	11200	9300	14100	11300	12900	16300
2007	2500	6400	8100	6800	4500	2300	7200	5900	6700	8700

Figure 3. The green mass yield (grassland)



	V1	V2	V3	V4	V5	V6	V7	V8	V9	V10
2004	970	4890	3500	4060	3190	3380	4800	3400	4750	4590
2005	1900	4520	4130	4900	4670	4030	4730	3460	4430	4420
2006	1600	5700	6150	7550	4550	3850	5300	5350	6150	6700
2007	1200	2900	3700	3000	2100	1600	2800	2600	3200	3900

Figure 4. The hay yield (grassland)

Comparing the abandoned arable land with the permanent grassland, the last one is visibly influenced by fertilization starting with the first year from the fertilization, this responding better to this maintenance work.

CONCLUSIONS

After the results obtained we can conclude as it follows:

- The best yield in the case an abandoned arable land is obtained in the variant fertilized with $N_{100} + P_{50} + K_{50}$ (21,580 kg/ha) and 20 t/ha manure (19,344 kg/ha), the greatest yield increases are registered starting from the second year from fertilization;
- The greatest hay yield obtained on the abandoned arable land are determined on the variants fertilized with $N_{100} + P_{50} + K_{50}$ (5395 kg/ha) and 20 t/ha manure (4836 kg/ha) in 2005;
- In the case of the permanent grassland the best yield of green mass is obtained starting with the first year from fertilization on the variant where was applied 20 t/ha manure the yield being 19,560 kg/ha;
- The greatest hay yields from the permanent grassland were obtained in 2006, the best result being determined on the variants fertilized with 60 t/ha manure and the yield being 7550 kg/ha;
- In 2007 is determined a decrease of the yield for all the experimental variants because of the climatic conditions that haven't allowed the vegetation recovery after the first cut;
- The effect of the fertilizers applying on the abandoned arable land in succession to grassland is more powerful from the point of view of the yield starting with the second year from the fertilization;
- The permanent grassland is responding better to fertilization then the abandoned arable land, this responding starting with the first year from the fertilization.

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