# SOIL PRODUCTION CAPACITY FROM PERIAM, TIMIŞ COUNTY FOR DIFFERENT CROPS AND AGRICULTURAL USE

# CAPACITATEA DE PRODUCȚIE A SOLURILOR DIN COMUNA PERIAM, JUDEȚUL TIMIŞ, PENTRU DIFERITE CULTURI AGRICOLE

**Anişoara DUMA-COPCEA, V. ŞTEFAN, Casiana MIHUȚ**

***University of Agricultural Sciences and Veterinary Medicine of the Banat' Timişoara***
*Corresponding author: Anişoara Duma-Copcea, e-mail:duma_anisoara@yahoo.com*

***Abstract**: For soil production capacity appreciation of agricultural fields from Periam, Timiş County we selected from the entire weather conditions a number of 17 more significant indicators that can be precisely determined. Relying on these indicators and on the scales we extracted from tables, annexes 3 – 1 to 3 – 18, (in conformity with the elaboration methodology of soil studies, second part) hierarchy coefficients that express de favorability degree of an indicator for every crop and usage category of agricultural field.*

***Rezumat:** În vederea aprecierii capacității de producție a terenurilor agricole din comuna Periam, județul Timiş am ales din întregul ansamblu al condițiilor de mediu 17 indicatori, mai semnificativi, mai precis determinanți. Pe baza acestora şi a scărilor valorice s-au extras din tabelele, anexe 3-1 până la 3-18, (conform cu metodologia de elaborare a studiilor pedologice, partea a –II – a ) coeficienți de bonitare, care exprimă gradul de favorabilitate a unui indicator pentru fiecare cultură şi categorie de folosință a ternului agricol*

***Key words**: soil, physical and chemical features*
***Cuvinte cheie:** sol, proprietăți fizice şi chimice*

## INTRODUCTION

Being an area with a good drainage we find chernozem soils that are specific to the north–west area.

We can separate this type of soil in many subtypes, and the dominant subtype is the wet water table chernozem. Due to the physic, chemical and biological proprieties these types of soils have a higher natural fertility. On this type of soil we have good cereal, technical plants and fodder cultures.

In depression areas we have gley-soils that appear due to the risen water table rich in potassium.

## MATERIAL AND METHOD

The samples were processed and the following analyses were made using the following methods:

Physical proprieties determination:

The texture of the soil was determined through the Cernikova method (dropping method has the following principle: different speed sedimentation of the liquid particles, in conformity with their size and the Stokes law).

The stability of the granule-like fractions in weight percents was made following the formulas:

- Brutish sand (2 – 0.2 mm in diameter)% = $m_1$ x 100/$m_0$ x F;
- Fine sand (0.2 – 0.02 mm in diameter)% = 100 x $m_2$/m';
- Dust (0.02 – 0.002 mm in diameter)% = ($m_2$ – $m_3$) x V x 100 / (v x $m_0$) x F;
- Clay (with the diameter < 0.002 mm)% = $m_3$ x (V x 100 / V x $m_0$ - d) x F in which:

$m_0$ – the soil quantity in g;
m1 – the brutish sand quantity in g;
m2 – the quantity of particles extracted at the first dropping (P+A) in g;
m3 – the quantity of particles extracted at the second dropping (A);
V – the volume of the suspension in the sedimentation cylinder in $cm^3$;
v – the dropper volume in $cm^3$;
d – correction factor that depends of the nature of the dispersant used to treat the samples and that has the value:
1.6 – when using sodium hydroxide;
10.2 – when using sodium hexa-meta-phosphate;
m' – the mass of dry and carbonate free soil (g);
100 – perceptual report factor.

Determining the chemical proprieties:

Determining the humus content of the soil was made through titration methods – the Tiurin method.

The method consists of oxidation of the humus carbonate with a chromium anhydride or potassium bi-chromate in the presence of sulfuric acid.

Equipment and materials: 100 ml conic pot; 300 ml conic pot; 20 – 25 ml and 50 ml burette; glass pear, analytical balance and heating installation.

Reagents: silver sulfate (mercury or aluminum); oxidative substance; orto-phosphoric acid 85%; di-phenyl-amine solution 0.5%; Mohr salt 0.1 n.

The humus content of a soil sample was calculated with the following formula:

Where:

$V_1$ – is the volume of Mohr salt solution 0.1 n consumed at titration of the witness sample (m1);

$V_2$ – is the volume of Mohr salt solution 0.1 n consumed at titration of the chromic acid excess from the analyzed soil (m1);

F – is the factor of the Mohr salt;

0.0005181 – is the humus content in g oxidizing 1ml chromic acid 0.1 n;

M – is the weight of the analyzed soil sample (g);

K – is the coefficient calculated for the referred result regarding the completely dried soil.

Soil reaction (pH) was determined through the potentiometric method with pH sensitive glass electrode, at a soil: water report of 1 : 2.5;

Phosphor and mobile potassium determination, extraction of ammonium acetate lactate, at a pH of 3.75 and the calorimetric dosage of phosphor with molybdenum – tin chloride – ascorbic acid after the Murphy method, respectively flam-photometry of potassium.

Determination of the total capacity of cationic exchange (T) was made after the Bower method through the saturation of the soil with sodium from sodium acetate 1 N at a pH of 8.2.

In the case of saturated soils with base ions $T = S_B$.

In the case of the soils that absorbed both base positive ions and hydrogen ions, $T = S_B + S_H$.

The degree of base saturation (V) – defines the proportion in which the colloidal complex is saturated by base positive ions and was calculated with the formula:

The high values of V% express a weak elutriation, neutral to alkaline reaction and a series of favorable proprieties the exception being the saturated solutions that have V = 100% but present positive sodium ions that give unfavorable proprieties.

The low value of v% expresses a strong elutriation, debasing and an acid reaction and less favorable soil proprieties for the growth and development of crops.

The exchange base capacity (exchange base sum) ($S_B$) – is measured in m.e. / 100g completely dried soil at $105^0$C and results from the total of basic positive ions $Ca^{2+}$ + $Mg^2$ + $K^+$ + $Na^+$ absorbed in the colloidal complex of the soil.

The exchange capacity for hydrogen (absorbed hydrogen) ($S_H$) – is measured in m.e. / 100 g soil and represents the total amount of positive hydrogen ions absorbed in the colloidal complex of the soil.

$S_H$ determination was made through the leaching of the soil until exhaustion with a tampon solution of potassium 1 N at a pH of 8.3.

And the hierarchy methodology.

**RESULTS AND DISCUSSION**

*Table 1.*

Soil favorability from Periam, Timis County for wheat, barley, corn and sun flower crops

| Nr. | Soil type | Wheat | | Barley | | Corn | | Sun Flower | |
|---|---|---|---|---|---|---|---|---|---|
| | | HN | DF | HN | DF | HN | DF | HN | DF |
| 1 | Chernozem | 90 | II | 90 | II | 90 | II | 90 | II |
| 2 | Typical chernozem | 80 | III | 80 | III | 80 | III | 80 | III |
| 3 | Black gley-soil | 46 | VI | 46 | VI | 45 | VI | 48 | VI |
| 4 | Typical gley-soil | 39 | VII | 43 | VI | 44 | VI | 48 | VI |

*HN = hierarchy note
*DF = degree of fertilization

From the hierarchy notes analysis for the straw-like crops (autumn wheat and barley) we can observe an accentuated difference of the soil units in what concerns the conditions that are created for the plants. The biggest notes are obtained by the typical chernozem with a degree of fertilization of II, respectively III.

*Table 2.*

Soil favorability from Periam, Timis Couny for potatoes and beet crops

| Nr. | Soil type | Potatoes | | Beet | |
|---|---|---|---|---|---|
| | | HN | DF | HN | DF |
| 1 | Chernozem | 90 | II | 90 | II |
| 2 | Typical chernozem | 90 | II | 90 | II |
| 3 | Black gley-soil | 53 | V | 46 | VI |
| 4 | Typical gley-soil | 53 | V | 58 | V |

*HN = hierarchy note
*DF = degree of fertilization

For the potato and sugar beet crops we obtained high values in chernozem and lower values in gley-soils.

The low values of gley-soils are explained by the exigency that these crops manifest towards the climate conditions and the physical and chemical proprieties in which the root system develops and from where the main production is obtained – roots and tubers.

*Table 3.*

Soil favorability from Periam, Timis County for linseed oil, flax bundle and hemp crops

| Nr. | Soil type | Linseed oil | | Flax bundle | | Hemp | |
|---|---|---|---|---|---|---|---|
| | | HN | DF | HN | DF | HN | DF |
| 1 | Chernozem | 90 | II | 90 | II | 90 | II |
| 2 | Typical chernozem | 70 | IV | 70 | IV | 70 | IV |
| 3 | Black gley-soil | 46 | VI | 33 | VII | 39 | VII |
| 4 | Typical gley-soil | 46 | VI | 33 | VII | 33 | VII |

*HN = hierarchy notes
*DF = degree of fertilization

Linseed oil, flax bundle and hemp find less favorable conditions in black gley-soil and typical gley-soil.

*Table 4*

Soil favorability from Periam, Timis County for pastures and hay-fields

| Nr. | Soil type | Pastures | | Hay-fields | |
|---|---|---|---|---|---|
| | | HN | DF | HN | DF |
| 1 | Chernozem | 90 | II | 90 | II |
| 2 | Typical chernozem | 80 | III | 80 | III |
| 3 | Black gley-soil | 65 | IV | 56 | V |
| 4 | Typical gley-soil | 47 | VI | 41 | VI |

*HN = hierarchy notes
*DF = degree of fertilization

Hay-fields manifest an exigency towards the physical and chemical proprieties of the selected soils which leads to the drop of hierarchy notes at the following soils: black gley-soil and typical gley-soil.

*Table 5.*

Soil favorability from Periam, Timis County for apple, pear and plum trees

| Nr. | Soil type | Apple tree | | Pear tree | | Plum tree | |
|---|---|---|---|---|---|---|---|
| | | HN | DF | HN | DF | HN | DF |
| 1 | Chernozem | 80 | III | 70 | IV | 90 | II |
| 2 | Typical chernozem | 80 | III | 80 | III | 90 | II |
| 3 | Black gley-soil | 14 | IX | 14 | IX | 14 | IX |
| 4 | Typical gley-soil | 12 | IX | 12 | IX | 12 | IX |

*HN = hierarchy notes
*DF = degree of fertilization

The trees present an exigency especially regarding the gleization and alkalization processes. The presence of small depth mineralized water table expels the placement of apple, pear and plum cultures on black gley-soil and typical gley-soil.

*Table 6*

Soil favorability from Periam, Timis County for grape vine and table vine

| Nr. | Soil type | Grape vine | | Table vine | |
|---|---|---|---|---|---|
| | | HN | DF | HN | DF |
| 1 | Chernozem | 90 | II | 90 | II |
| 2 | Typical chernozem | 80 | III | 80 | III |
| 3 | Black gley-soil | 17 | IX | 17 | IX |
| 4 | Typical gley-soil | 18 | IX | 21 | VIII |

*HN = hierarchy notes
*DF = degree of fertilization

Unfavorable or less favorable conditions for these soils are given by the following types of soils: black gley-soil and typical gley-soil.

*Table 7*

Soil favorability from Periam, Timis County for vegetables

| Nr. | Soil type | Vegetables | |
|---|---|---|---|
| | | HN | DF |
| 1 | Chernozem | 90 | II |
| 2 | Typical chernozem | 80 | III |
| 3 | Black gley-soil | 14 | IX |
| 4 | Typical gley-soil | 12 | IX |

*HN = hierarchy notes
*DF = degree of fertilization

Vegetables can be easily cultivated on soils with a secure water source for irrigation purposes and a series of other favorable elements.

Favorable conditions are given by the following types of soils:

- Chernozem with a score of 90 and a fertility degree of II;
- Typical chernozem with a score of 80 and a fertility degree of III.

Unfavorable conditions for this type of crop due to short horizons, erosion and surface calcium carbonate are given by the following types of soils:

- Black gley-soil and typical gley-soil have bonus notes which are framed in the IX fertility degree.

**CONCLUSIONS**

Chernozems are soils that have the best physical and chemical proprieties, and that is why they have a high production potential.

Chernozems are good for every type of crop.

We obtained good results in: wheat, barley, corn, beet, sun flower and potatoes.

Good results are obtained in vine and fruit trees.

To grow chernozem fertility it is recommended:

- Agro-technical works that will lead to accumulation and maintenance of water in the soil;
- Periodic appliance of organic fertilizers and moderate fertilization with NPK;
- Monoculture avoidance and rigorous appliance of a crop rotation;
- Completion of the humidity deficit through irrigations in case of sugar beet, corn etc.;

On the gley-soils, due to the periodical oscillations of the water table that influences negatively the physical and chemical parameters and the fertility, the crops hardly bear the lack and the excess of humidity.

The gley-soils that developed on more permeable rocks that have a better drainage are more productive, being covered with pastures or medium quality forests.

After amelioration we can cultivate: wheat, corn, barley, sun flower.

Gley-soils are not recommended for vine or fruit trees cultivation.

For the fertility growth of the gley-soils it is recommended:

- Organic and mineral fertilization;
- Application of calcareous amendments.

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