PRESENT ASPECTS CONCERNING THE BEHAVIOR IN EXPLOITATION OF SUBSOIL DRAINING AND DRAINAGE, ASSOCIATED TO MODELING IN RIDGE STRIPS, IN THE BAIA EXPERIMENTAL FIELD-MOLDOVA HYDROLOGICAL BASIN

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The natural conditions in the extra-Carpathian zone of the Moldova river meadow and hydrographical basin from the Păltinoasa-Timişeşti field, which also includes the Baia Depression, have favoured water excess in soil. Subsurface drainage, associated to modeling in ridge strips from the Baia experimental field was set up in 1978 on a stagnic-glosic albic Luvosol. The project comprised an area of 3.00 ha, on which six technical solutions of conducting low depth subsoil drainage were found. Before conducting the works of subsoil drainage, soil was used only as natural meadow with perennial hygrophyte vegetation. In the first stage of the years 1978-1995, the soil from drainage field was first cultivated with annual plants. In the second stage of the years 1996-2007, soil was used for animal grazing. The pasture was formed as a result of field sowing with a mixture made of 70% grasses and 30% legumes. The behaviour in exploitation of soil improvement works was studied as concerns the sustainability of the projects for subsoil drainage, associated to the modeling in ridge strips and the evolution in time of some characteristics of drained and cultivated soil. After the first cycle, we have determined, according to the accurate measurements of geometric leveling, an average height of ridges of 18-29 cm, compared to the level of channels. The average transversal slope of profiles was of 2-3%. The average initial depth of placing suction drains at 0.942 m has registered after the first exploitation cycle the value of 0.812 m, as a result of land modeling in ridge strips and, respectively, the process of settling the drained soil. After the second cycle, when no works of restoring the field modeling in ridge strips were done, and soil from the drainage field was used as natural meadow, the constructive parameters were maintained within the limits relatively close to the first period.

***Keywords**: water excess, subsurface draining and drainage, modeling, measurements of geometric leveling, settling of drained soil, soil chemical characteristics.*

The local rural development needs an infrastructure which ensures the sustainable utilization of soil resources. Besides promoting rural projects, which should be achieved in the next period of time, the rehabilitation of present water improvement systems of subsoil draining and drainage is also required.

For a better capitalization of soil resources, we have to know the causes of soil degradation, which involves the qualitative value. Among the main restrains of soil quality at the world and local level, the moisture excess is found in many soil-climatic zones from Romania. According to data of the Statistical Yearbook of Romania (2004), the moisture excess from soil affects **3,781 thousands ha**. Under natural conditions of soil resources from Hungary, **Várallyay Gy., 2006** has found eight restraint factors of soil fertility, of which soil erosion caused by water and wind (**15.6%** from total area of Hungary); soil acidity **(12.8%)**; salinity and/or alkalinity **(8.1%)**; rough texture **(8%)**;fine texture **(6.8%)**.

The area appropriate to the administrative territory of the Suceava County was included in the map of ecological units from Romania **(Florea N., 2005**) in two separate geographical regions: Eastern Carpathians in the eastern side - zone of soils with cold climate- highly moist; Eastern Sub-Carpathians from the east side and the Suceava Plateau - zone of soils with cool-wet to warm-semi wet climate.

For an efficient utilization of farming land resources and, especially, of excess moisture soils, intensifying soil mapping works at high scale and including in soil maps of environment protection indicators are required (**Munteanu, I., 2005).**

The natural conditions from Sub-Carpathian field of the ecological zone of Păltinoasa-Timişeşti, which also includes the Baia Depression with its specific forms of relief, river meadow and terraces of the basin of the Moldova river, have favoured in time, the moisture excess in soil, caused by rainfall and ground waters. In order to regulate the water regime of soil and capitalize the fertility potential of soils periodically and/or permanently affected by water excess, hydroameliorative systems of subsoil draining and drainage were projected. In the ecological units affected by moisture excess from Suceava County, over 20 great systems of subsoil draining and drainage were projected. The total area of draining projects is of 55000 ha, which have nowadays an exploitation duration of 30-50 years. Within the draining systems with open drains, systematic networks of subsoil drainage with a total area of 28000 ha have been projected (**Moca,V., et al.,1996).**

Under the conditions of wet and cool soil-climatic zone from Baia Depression, technical solutions were experienced for projecting systematic networks of subsoil drainage, adopted according to the requirements of improving different soil types and local materials. The experimental projects were carried out for the first time in **1973** and, afterwards, in **1978.** The experimental results obtained under conditions of experimental fields have been used for dimensioning the hydroameliorative system from Baia Depression, during **1978-1980**. The subsoil drainage, associated to field modeling in ridge strips, deep loosening, calcium amendment, improved fertilization and others , has been investigated in time as concerns the behavior in exploitation of technical solutions **(Moca,V. et al., 2006).**

MATERIAL AND METHOD

The experimental field of farming drainages, with the duration under exploitation of 30 years (1978-2007), was placed on a platform of upper terrace found on the left side of the Moldova River, in the extra-Carpathian zone of the drainage basin, which is situated in the north-eastern side of the depression region from Baia. The main components of the natural environment and soil improvement works, as well as the means of carrying out observations on geometrical leveling and analysis of soil are presented below:

a. Environment conditions from the experimental field of farming drainage

▪ *Soil:* albic pseudogleic glossic Luvisol (SRCS - 1980);
albic stagnic glossic Luvosol (SRTS - 2003);

▪ *Relief:* high terrace platform of the Moldova River, slightly bent to South-East, longitudinal slope 2-5%, absolute height 393 m;

▪ *Parental material:* stratifications of dusty clay, 10 -15m;

▪ *Global natural drainage:* weak to very weak;

▪ *Typical eco-region:* extra-Carpathian passage of the hydrographic basin of the Moldova River;

▪ *Ground water:* average depth of 9 -10 m, with permanent regime;

▪ *Stagnant water:* average depth 0.2-0.5 m, with temporary regime;

▪ *Climate*: Tma=7.9^{o}C; Pma=806 mm; ETP= 599 mm;

▪ *Natural vegetation:* hygrophilous meadow made up of the association *Agrostis tenuis* and the sub-association *Deschampsia caespitosa, Juncus effuzus, Carex sp.*;

▪ *Farming usage:* natural meadow before the projection of subsoil drainage works, farming ecosystem after soil improving and the return to the initial usage.

b. The project draft of subsoil drainage associated to modeling of the field in strips

The subsoil drainage at low depth has the role of removing water excess from soil, which was mainly caused by excess rainfall and surface runoff. It was projected in 1978 on a total area of 3.00 ha and had six technical solutions. For making the drainage tranches we have used the ETȚ- 202A equipment for digging and placing the adsorbing drains; the width of tranches is of 0.50 m and the longitudinal slope of 2‰.

On the experimental plot of the subsoil drainage, associated to field modeling in ridge strips and rills, with an afferent area of 6 000 square meters, three lines of absorbing drains with rills were made: DR_1, DR_2 and DR_3 (*figure 1*), having the following constructive elements:

Average depth of placing absorbing drains: DR_1 = 0.931 m; DR_2 = 0.961 m; DR_3 = 0.935 m;

Distance between absorbing drains with surface rills: 20 m;

Length of absorbing drains with surface rills: 100 m;

Longitudinal slope of adsorbing drains made of ceramic pipes: 2‰;

Nature and diameter of drainage pipes: DR_1 and DR_3 - ceramics Ø 70 mm; DR_2 - ceramics Ø 125 mm;

Nature and thickness of drainage filter: DR_1= ballast (20 cm)+flax stems (60 cm); layer of soil covered with vegetal (20 cm) DR_2= ballast as filtering layer with width of 20 cm and height of 70 cm + layer of soil covered with vegetal (20 cm) ; DR_3= ballast (20 cm)+ layer of soil covered with vegetal (20 cm).

c. Soil improvement and farming cultivation works, applied in the drainage field

Modeling of field drained in ridge strips and rills of intercepting and removing water excess was done in the year of drainage projection (1978) and then was repeated every year and periodically until 1989. Soil improvement and farming cultivation works were differentiated according to the following exploitation periods:

- Experimental cycle 1 (1978 - 1988): superficial exploitation leveling; meadow clearing; deep loosening at the depth of 0-60 cm; soil amendment with a rate of 10-12 t/ha pit lime with a content of 95 - 100% Ca CO_3; base organic fertilization with 40 t/ha of medium fermented manure; mineral fertilization.

- Experimental cycle 2 (1989 - 1995): deep loosening done again at the depth 0 - 60 cm ; soil amendment done again with a rate of 7-8 t/ha pit lime with a content of 95 - 100% Ca CO_3; base organic fertilization done again with 40 t/ha of medium fermented manure; mineral fertilization.

- Experimental cycle 3 (1996 - 2007): natural meadow without soil improvement works.

- Crop rotations and crops: maize-two-row barley-potato-fiber flax (1979-1982); (wheat+rye) - (maize+potato) - maize - potato (1983 - 1986); mixtures of seeded perennial grasses (grasses 70% + legumes 30 %) with three year duration of exploitation (1987 - 1989) and seeded again with six year period of usage (1990 - 1995); natural meadows without soil improvement works, during 1996 - 2007.

d. Assessment of the drainage behavior under exploitation with field modeling in ridge strips

In order to investigate the drainage behavior under exploitation with field modeling, we have used a topographic network made of supporting and raising points, which was first determined planimetrically and then altimetrically, by the method of geometrical leveling, combined with longitudinal and transversal profiles (*figure 1*). The observations of geometrical leveling were carried out with a mean accurate level of the type Zeiss Ni - 025, with oscillated optical compensator and centimeter surveying rods. The network of supporting, raising and controlling points includes the following categories of landmarks and topographical points:

- Supporting landmarks of geometrical leveling traverse: R_1 şi R_2 ;
- Stations of geometrical leveling traverse: 102 ,103 şi 104;
- Longitudinal profiles on the axis of absorbing drains with rills: DR_1, DR_2 , DR_3;
- Control points from the transversal profiles on zone rills-ridges: I-I´ ... X-IX´.

The subsidence of drained and modeled soil was assessed according to topographic measures, which were done in the initial moment of drainage projecting in 1978, then were repeated after the experimental cycles, during 1978 - 1995 (cycle I) and 1996-2007 (cycle II).

e. Sampling and analysis of soil from the control points on plots/variants

In order to quantify some modifications of physical and chemical characteristics of the improved soil, under the conjugated effect of the complex of soil improvement works, we have analysed their dynamics according to the cyclical soil sampling at the depth of 0-20 cm, from the 225 control points situated on transversal profiles from the drain-rill zone and ridge zone (*figure 1*).

The analysed physical and chemical characteristics of soil samples taken from the drainage field have been determined according to the standards from **"The Methodology of Elaborating Soil Studies",** I.C.P.A., 1987, as it follows: density (D), apparent density (DA), soil moisture (Wg) ; pH acidity (H_2o); humus content (Ct x 1.72%); total nitrogen (Nt %); C / N ratio and humus stock, t / ha.

RESULTS AND DISCUSSION

Under the environment conditions from Baia experimental field, the glossic stagnic albic luvosol has shown before the projection of subsoil drainage, associated to land modeling in ridge strips, the following succession of genetic horizons: **A_0 - (0 - 5 cm); A_0 (W) - (5 - 18 cm); Ea W - (18 - 30 cm); EBW - (30 - 46 cm); Bt_1W - (30 - 46 cm); Bt_1W - (46 - 97 cm); Bt_2W - (97 - 150 cm).** After applying soil improvement works and the cultivation of drained soil, the anthropic horizon **(A_0 + Ea)p** ,with a thickness until 30-40 cm, has appeared on the high zone of ridges. For the assessment of the present stage of the behavior in exploitation of hydro-ameliorative and of modeling in ridge strip works, we have investigated both the configuration of field microrelief transversally and longitudinally, and the dynamics of certain modifications of soil chemical characteristics on plots/variants. The obtained results have been analysed on the two cycles of faming usage, in years 1978 - 1995 and 1996 - 2007, which sum up an exploitation period of 30 years.

a. Behaviour in exploitation of modeling works in ridge strips and rills

Field modeling in ridge strips and rills was achieved first in 1978 and, then repeated each year in the first three years, and periodically, during 1981 - 1989. For modeling, moldboard ploughing was used, which resulted in obtaining ridges, separated one from another, gathering rills for surface water excess. The project draft of subsoil drainage, associated to modeling of field in ridge strips and rills at the distance of 20 m between them (DR_1 DR_2 DR_3), with a length of 100 m, includes the two distinctive exploitation zones, ridges and rills, with the height of 10 m, each (*figure 1*).

The calculation of absolute heights from exploitation cycles has been determined according to the initial reference field area from 1978. The geometrical observation network has comprised nine transversal profiles: I-I´ , ..., IX-IX´ and respectively, three longitudinal profiles DR_1, DR_2, DR_3, which sum up 225 control points for the field microrelief and 27 control points for the depth of placing drainage pipes.

After the first period of 18 year farming exploitation (1978 - 1995), in which moldboard ploughing alternated with transversal soil tillage on ridges, the uniform relative preservation of modeled field microrelief was ensured. For this exemplification, we presented heights of field, level differences and transversal slope, in the case of the 25 control points placed on the transversal profile III-III' (*figure 2*).

From data presented for exemplification in the transversal section III-III', we may notice the height of ridges, in their central side (points 1, 9, 17, 25), compared to the level of surface runoff rills (points 5, 13, 21). Under the studied conditions, we have obtained a height of ridges, which was comprised from 17.8 to 18.0 cm, for the zone of drain DR_2 and until 25.9 to 29.0 cm for zone of drain DR_3. According to the size of level differences and partial distances between control points, the transversal slopes of modeled field have been expressed from 0.3% to 3.9% on 2.50 m sections. On the six sides of the field modeled in ridge strips with the length of 10 m, the values of the transversal average slope were from 1.8 % to 2.9 %.

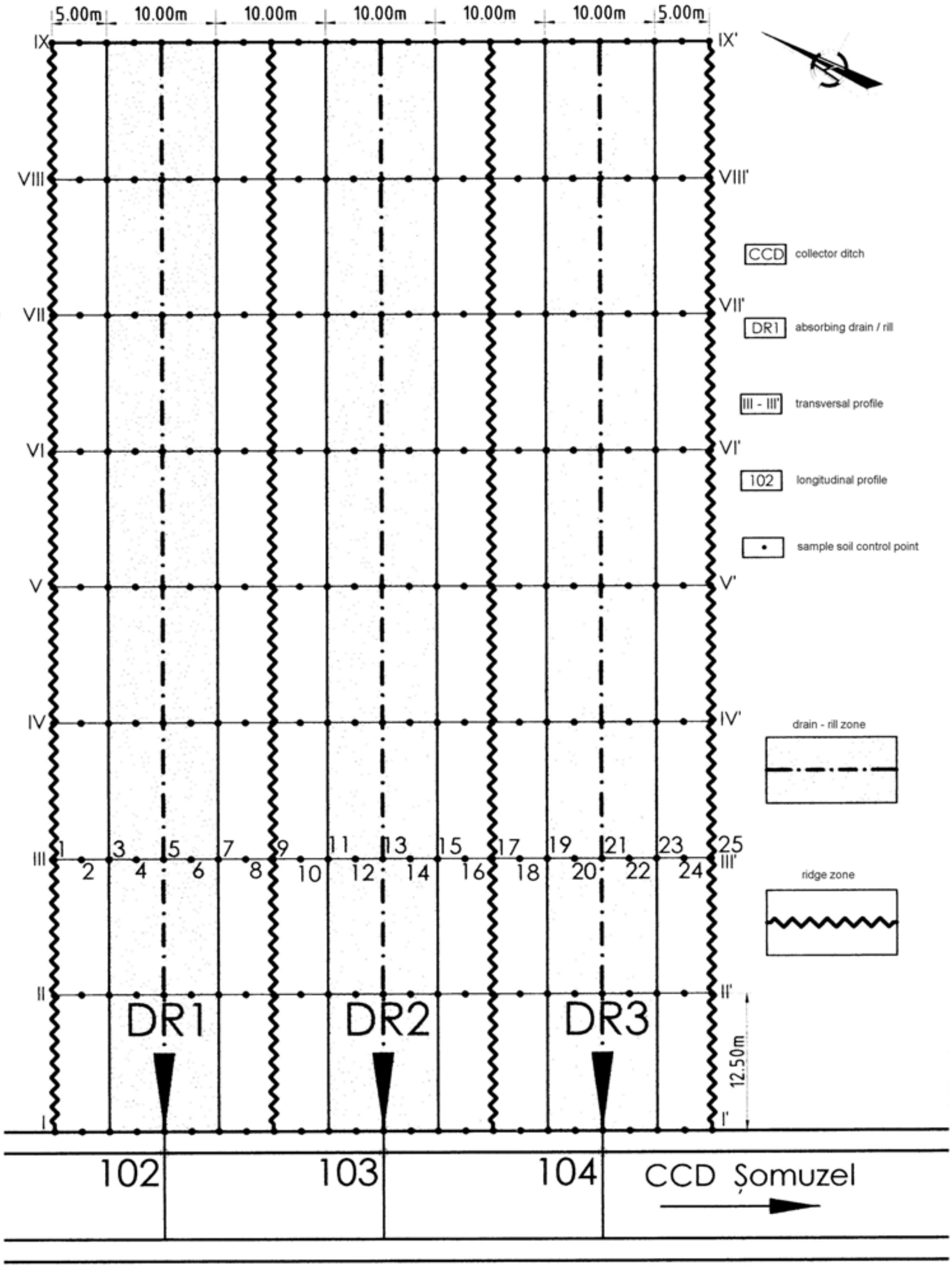

Figure 1. **Project draft of subsoil drainage associated to modeling the field in ridge strips and rills from the Baia experimental field - watershed Moldova River**

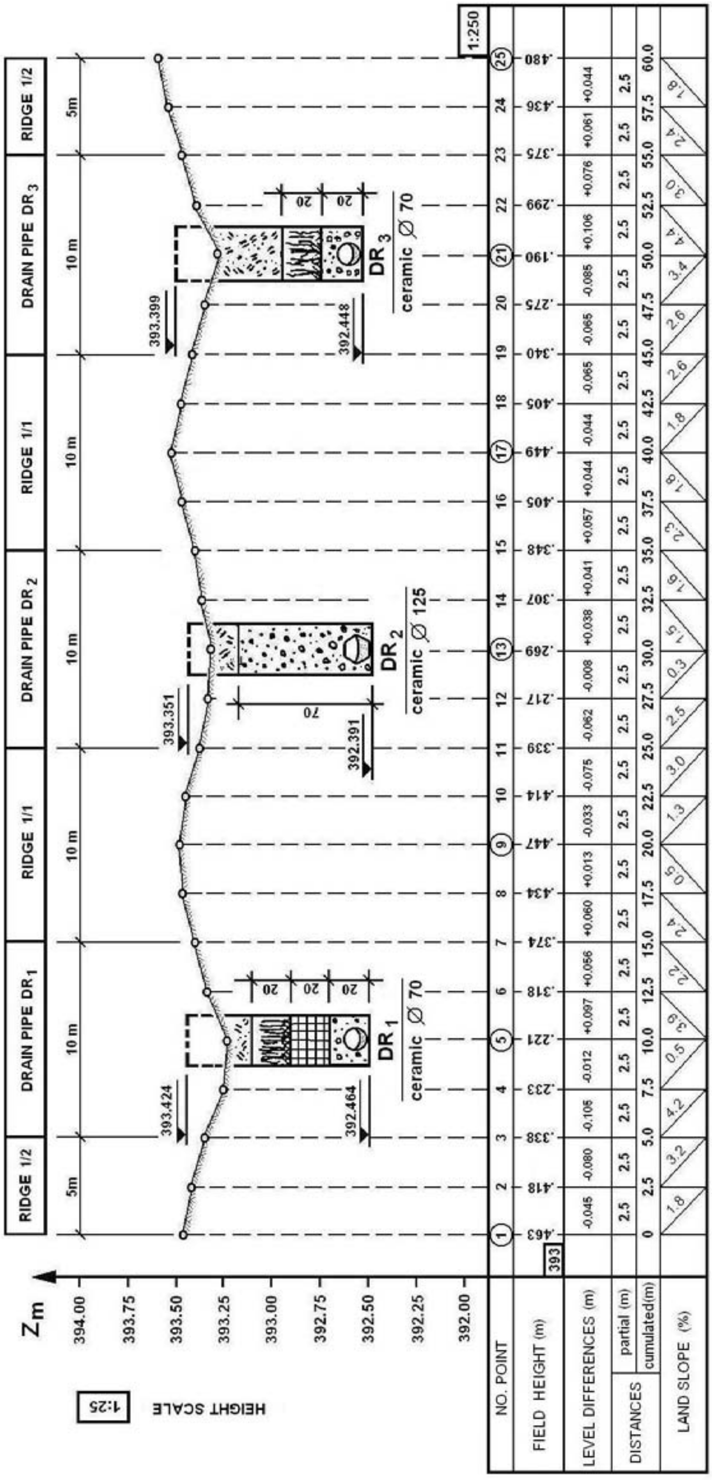

Figure 2. **Transversal section (III - III') on lines of subsoil drainage DR_1 - DR_2 - DR_3 associated to field modeling in ridge strips, in the observation cycle between 1978 – 1995**

Under conditions of the 12 year second exploitation cycle (1996 - 2007), in which farming cultivation works were not applied, because the field was used as meadow for animal grazing, we found out that the results obtained were maintained under relatively close limits to those from the first cycle, but having greater variations because of uneven degree (*figure 3*).

Data presented in the transversal section III-III', which expresses the modification of the microrelief configuration of modeled field on the direction drains/rills and ridges pointed out differentiations between the two observation cycles.

The height of ridges was situated between the limits of 17.7 - 24.1 cm (drain DR_3) and 15.5 - 37.1 cm (drain DR_1).

The partial transversal slopes between control points, with the distance between them of 2.50 cm, were situated within the interval comprised between 0.2 % and 4.8%. As concerns the average transversal slope on the constant length of 10 m, we noticed its constancy between 1.8 % and 3.7 %.

b. Behavior in exploitation of subsoil drainage works

Under conditions of the Baia experimental field of farming drainage, we have investigated the experimental plot with an area of 6000 m^2, which comprises three lines of absorbing drains DR_1 ,DR_2, and DR_3 . The estimate of the depth of placing absorbing drains was done according to the absolute heights of control points, which have been established in the initial (1978), intermediary (1995) and final stages (2007), of the two observation cycles.

The relative heights corresponding to the depth of placing absorbing drains (h_i) were expressed according to the relation:

$$h_i = Ht_i - Hd_i,$$

in which

i - number of the control point on the longitudinal axis of the drain;

Ht_i - absolute height of the control point at the field surface ;

Hd_i - absolute height of the control point from the trench of absorbing drain.

According to the depth of placing drains (h_i) in the initial stage and in the two cycles of observations, the values of settling registered on the vertical of the control point, by means of expressions:

$$\Delta h_i^I = (h_i^1 - h_i^0) \text{ şi } \Delta h_i^{II} = (h_i^2 - h_i^0),$$

where:

h_i^0 - depth of placing drain in the initial stage (1978);

h_i^1 - depth of placing drain in the first cycle (1978 - 1995);

h_i^2 - depth of placing drain in the second cycle (1996 - 2007).

The analysis of data from **Table 1** has shown that the depth of placing drains differentiated according to the technical solutions of making the filtering layer and respectively, the evolution of microrelief configuration of the field modeled in ridge strips and rills. Significant differentiations were found between the individual values of the initial depths of placing the absorbing drains and the present ones, determined after each of the two cycles of observations.

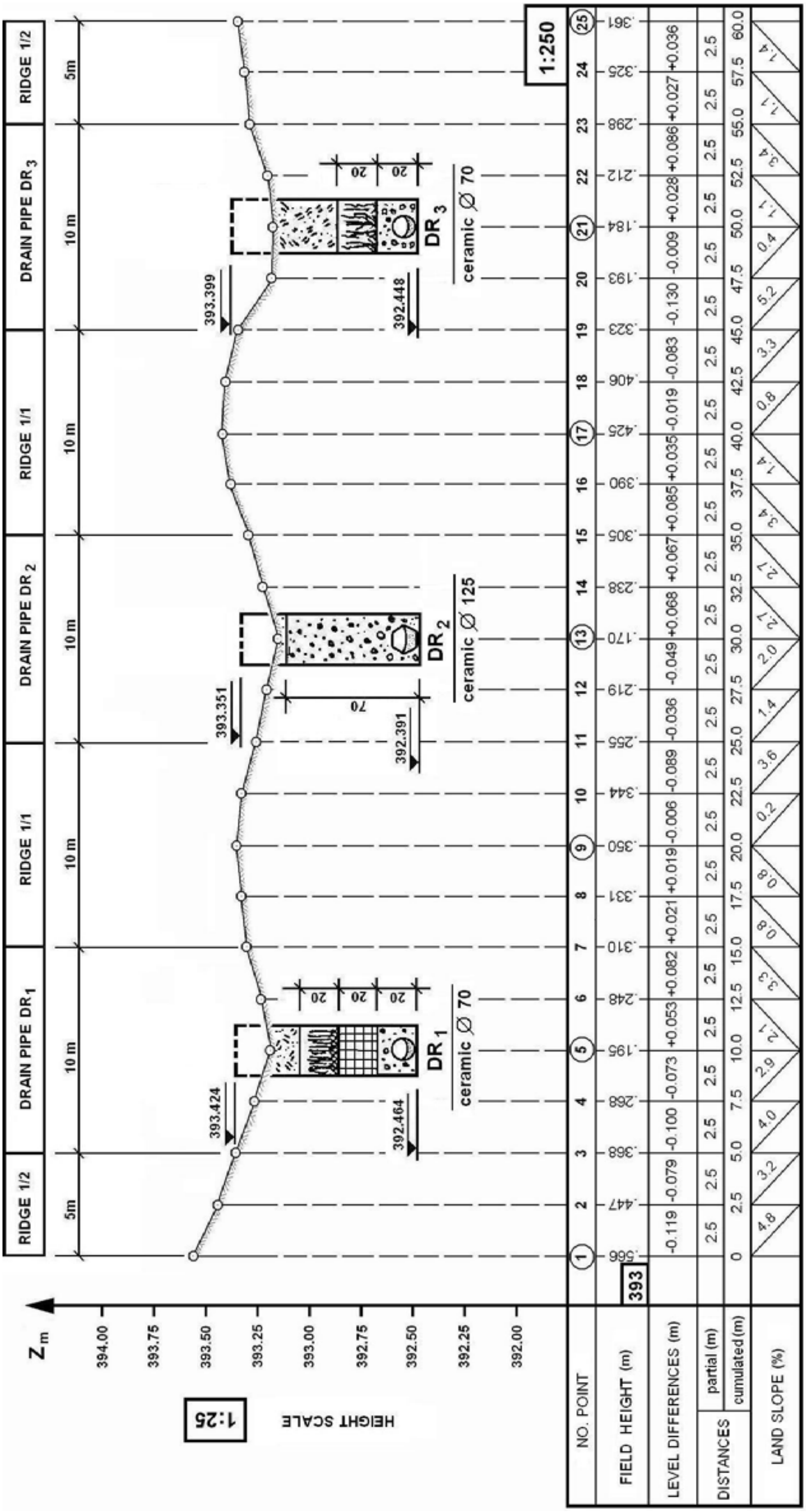

Figure 3. **Transversal section (III - III') on lines of subsoil drainage DR_1 - DR_2 - DR_3 associated to field modeling in ridge strips, in the observation cycle between 1996 - 2007**

Table 1

Placing depth (h_i) measured in the control points on the longitudinal axis of absorbing drains (DR_1 - DR_2 - DR_3), in observation cycles during 1978 - 2007

No. points of obs.	DRAIN / RILL DR_1					DRAIN / RILL DR_2					DRAIN / RILL DR_3				
	Depth of placing drain (m)					Depth of placing drain (m)					Depth of placing drain (m)				
	Initial 1978	Cycle 1 1995	Cycle 2 2007	Level differences (Δh_i)		Initial 1978	Cycle 1 1995	Cycle 2 2007	Level differences (Δh_i)		Initial 1978	Cycle 1 1995	Cycle 2 2007	Level differences (Δh_i)	
i	h_i^0	h_i^1	h_i^2	$h_i^1 - h_i^0$	$h_i^2 - h_i^0$	h_i^0	h_i^1	h_i^2	$h_i^1 - h_i^0$	$h_i^2 - h_i^0$	h_i^0	h_i^1	h_i^2	$h_i^1 - h_i^0$	$h_i^2 - h_i^0$
1	1.090	1.072	1.063	-0.018	-0.027	1.162	1.145	1.121	-0.017	-0.041	1.105	1.073	1.071	-0.032	-0.034
2	0.968	0.910	0.849	-0.058	-0.119	1.052	0.946	0.880	-0.106	-0.172	0.987	0.873	0.865	-0.114	-0.122
3	0.960	0.849	0.793	-0.111	-0.167	0.960	0.851	0.735	-0.109	-0.225	0.951	0.818	0.688	-0.133	-0.263
4	0.945	0.845	0.645	-0.100	-0.300	0.977	0.821	0.834	-0.156	-0.143	0.938	0.774	0.776	-0.164	-0.162
5	0.955	0.832	0.652	-0.123	-0.303	0.907	0.801	0.818	-0.106	-0.089	0.937	0.765	0.772	-0.172	-0.165
6	0.902	0.817	0.659	-0.085	-0.243	0.927	0.779	0.803	-0.148	-0.124	0.900	0.755	0.769	-0.145	-0.131
7	0.900	0.757	0.610	-0.143	-0.290	0.900	0.710	0.720	-0.190	-0.180	0.895	0.719	0.612	-0.176	-0.283
8	0.847	0.716	0.529	-0.131	-0.318	0.933	0.675	0.708	-0.258	-0.225	0.850	0.640	0.697	-0.210	-0.153
9	0.815	0.699	0.669	-0.116	-0.146	0.835	0.638	0.810	-0.197	-0.025	0.857	0.662	0.803	-0.195	-0.054
Average	**0.931**	**0.833**	**0.719**	**-0.098**	**-0.212**	**0.961**	**0.818**	**0.825**	**-0.143**	**-0.136**	**0.935**	**0.786**	**0.783**	**-0.149**	**-0.152**

Under conditions of the filtering layer made of ballast (20 cm) + flex stems (50 cm) of drain DR_1; ballast (70 cm) + vegetal land (20 cm) of drain DR_2 and ballast (20 cm) + vegetal land (20 cm) of drain DR_3 , the differentiations of depth placing are pointed out after the respective exploitation periods. In comparison with the average depth placing of the three drainage lines of 0.931 m (DR_1), 0.961 m (DR_2) and 0.935 m (DR_3), we have noticed their settling from 0.719 m (DR_1) to 0.783 m (DR_3), after an exploitation period of the drainage of 30 years. The greatest settlings of the surface of drained soil were determined under conditions of filtering layer, where flax stems and sod with vegetal land were used, and the smallest ones, under the conditions of the ballast with the thickness of 70 cm.

The level differences expressed in the two cycles of observations have been generally characterized by relatively equal values in the control points from upstream and downstream of the axis of absorbing drain. Differentiations of the individual values resulted in the other control points, which had influence on the average value of settling on the entire length of the drain. Individual settlings expressed as level differences between the 27 control points have registered a relatively high variation which was situated between the following limits: - 0.018 m ÷ - 0.303 m (DR_1); - 0.017 m ÷ - 0.258 m (DR_2) and - 0.032 m ÷ - 0.283 m (DR_3), according to local slopes of the field.

Expressing settling as the average value on the length of 100 m of the three absorbing drains according to the 9 individual values from the control point has shown a relative differentiation between the two cycles of observations. In case of drain/rill (DR_1) , with the use of flax stems as filtering layer, the average tracing was of - 0.098 m after the first cycle of exploitation and of- 0.212 m after the entire period of farming exploitation. On the other two drains/rills (DR_2 and DR_3), the differences of average levels (Δh_i) are relatively equal both after the first cycle and after the entire period of farming exploitation.

c. Modifications of some chemical soil characteristics in the drainage field

The main chemical characteristics of the drained-modeled and cultivated soil were analysed at the depth of 0-20 cm, according to soil sampling in 225 control points of the two distinctive zones of the drainage field and, respectively, of the control plot. From the analytical data presented on plots/variants (*Table 2*) as individual and average values , on the two cycles of farming exploitation, an improvement in soil fertility was noticed under the effect of soil improvement works.

The soil response, shown by the pH values in watery extract (1 : 2.5), characterizes a significant improvement in exchangeable base saturation degree of the adsorptive complex of the improved soil (LDC and LDR) in comparison to the unimproved one (LM). The analytical data have shown a moderately acid reaction on the control plot (pH = 5.1), which, after the two exploitation cycles with a duration of 30 years, was maintained within the weakly acid limits on drainage plots (pH = 5.9 ÷ 6.3).

The content of organic matter (humus = Ct x 1.72) has registered an intense mineralization of humic substances, especially after the first intensive period of farming cultivation, during 1978 - 1995. The diminution in the humus content was found from high values of 10.5% on the control plot (LM) to 5.17% on the ridge drainage plot (LDC) and until 4.59% on rill drainage plot (LDR). The effect of mixture between horizons was also noticed, as a result of modeling works, where the average humus content had the value of 5.02% on ridges and 4.10% on rills, after the second cycle of observations (1996 - 2007).

Table 2

Modifications of some chemical characteristics of glossic stagnic luvosol on plots/variants of subsoil drainage, associated to modeling in ridge strips, from Baia experimental field , during exploitation period 1978 – 2007

Exploitation period	Indicative plot/variants	Depth of sample (cm)	pH (H_2O)	Humus Ct x 1.724 (%)	N total (%)	C / N	Humus stock (t / ha)
Cycle 1 1978 - 1995	LM	0 - 20	5.10	10.5	0.440	13.90	200.0
	LDC		5.90	5.17	0.270	11.10	127.2
	LDR		5.90	4.59	0.230	11.60	99.4
Cycle 2 1996 - 2007	LDC 1/2	0 - 20	6.19	5.47	0.291	12.73	128.0
	LDC 1/1		6.11	4.56	0.253	12.20	106.7
	LDC 1/1		6.14	4.89	0.267	12.40	114.4
	LDC 1/2		6.27	5.16	0.273	12.80	120.7
	Average	**-**	**6.18**	**5.02**	**0.271**	**12.53**	**117.5**
	LDR 1/1	0 - 20	5.79	4.46	0.220	13.72	101.7
	LDR 1/1		5.89	3.83	0.204	12.71	87.3
	LDR 1/1		5.94	4.01	0.209	12.99	91.4
	Average	**-**	**5.87**	**4.10**	**0.211**	**13.14**	**93.5**

The content of total nitrogen (Nt %) was generally correlated to the humus content, being comprised between relatively close values, both between the drainage plots and the two cycles of soil analysis , with a greater distribution on the peak of ridges, compared to the afferent surface from the rill zone.

The C/N ratio has registered higher values on the control plot (LM), compared to the drainage plot, which pointed out a more intense mineralization of the organic matter, produced in the arable layer (0 - 20 cm) of the improved soil. After projecting the drainage and cultivation of glossic stagnic albic luvosol, a significant improvement was noticed in the air-water regime of soil.

The humus stock has also expressed the effect of the mixture between genetic horizons, as a result of modeling works, and the long-term effect of the intense mineralization of humic substances. The humus stock expressed at the depth of arable layer (0 - 20 cm), on the control and drainage plots, has shown its diminution from 200 t/ha until 93.5 - 117.5 t/ha.

CONCLUSIONS

1. Land modeling in ridge strips, achieved with the distance of 20 m between absorbing drains/rills and the length of 100 m, first in 1978 and then, repeated every year and periodically during 1981 - 1989, was studied as concerns the modification of microrelief configuration of the modeled field.

2. After the first cycle of 18 year farming exploitation (1978 - 1995), in which moldboard ploughing alternated with transversal soil tillage on ridges, the relatively uniform microrelief of modeled field was maintained; the average height of ridges was of 18-29 cm and the average slope, of 2 - 3 %.

3. Under the conditions of the second cycle of 12 year farming exploitation (1996 - 2007), when no farming technologies were used, because land has been used as natural meadow, the dimensional elements were maintained, registering an average height of 16 - 37 cm and an average slope of 2 - 4 %.

4. The depth of placing drains was modified after the first cycle, as a result of settling process of the drained soil, with values comprised between - 0.098 m and - 0.149 m, and after the second cycle, this process was maintained; during 30 years, it registered values comprised between - 0.136 m, on the drain with filtering layer made of ballast of 70 cm thickness, and of - 0.212 m on the drain with filtering layer made of flax stems.

5. Limy and ameliorative fertilization amendments have resulted in a significant improvement of soil fertility , both by increasing pH values, which maintained within the limits of weakly acid soils, and by increasing the content of nutrients and improving elements of air and water regime.

6. The complex effect of draining, modeling and cultivation from the first experimental cycle has resulted in the intense presence of mineralization processes of humic substances, which were registered especially at the depth of the ploughed layer of 0-20 cm, where a diminution in humus content of 5-6% was registered, in comparison with undrained and uncultivated soil.

BIBLIOGRAPHY

1. Florea, N., 2005 - *Harta unităţilor ecologice din România*. Lucrările simpozionului "Factorii şi procese pedogenetice din zona temperată, vol.4 , serie nouă, p.109 - 116. Editura Universităţii "Al. I.Cuza,Iaşi
2. Moca, V., Radu, O., Filipov, F., Călin, M., 1996 - *Comportarea în exploatarea a solurilor cu exces de umiditate drenate şi modelate în benzi cu coame din Depresiunea Baia - Moldova*. Lucrări Ştiintifice, seria Agronomie, anul XXXIX, vol. 39, p. 42-48, ISSN 0379-8364. Universitatea Agronomică şi de Medicină Veterinară, Iaşi.
3. Moca, V., Bucur, D., Iuliana Breabăn, Radu, O., Huţanu, Cr., 2006 - *Dinamica indicatorilor de caracterizare fizică a solului din câmpul experimental de drenaje agricole Baia - Moldova*. Lucrări Ştiintifice, seria Agronomie, anul XXXXIX, vol. 49, nr. 2, p. 592 - 605, ISSN 1454 - 7414, Universitatea de Ştiinţe Agricole şi Medicină Veterinară, Iaşi, Editura „ Ion Ionescu de la Brad", Iaşi.
4. Munteanu, I., 2005 - *Despre cartarea pedologică şi harta de soluri în etapa actuală*, Revista Ştiinţa Solului, seria a III-a, vol. XXXIX, nr.1-2, p. 249 - 264. Publicaţiile S.N.R.S.S., Bucureşti.
5. Várallyay, Gy., 2006 - *Soil degradation processes and extreme soil moisture regime as enviromental problems in the Carpathian Basin*. Revista Ştiinţa Solului, seria a III-a, vol.XL, nr.2, p. 20 - 39, Bucureşti.
6. XXX, 1987 - *Metodologia elaborării studiilor pedologice. Partea a III-a - Indicatorii ecopedologici*, p. 94 - 111. Publicaţiile I. C. P. A., Bucureşti.
7. XXX, 2004 - *Anuarul Statistic al României*, Bucureşti.