

THE LONG TERM EXPERIMENTS

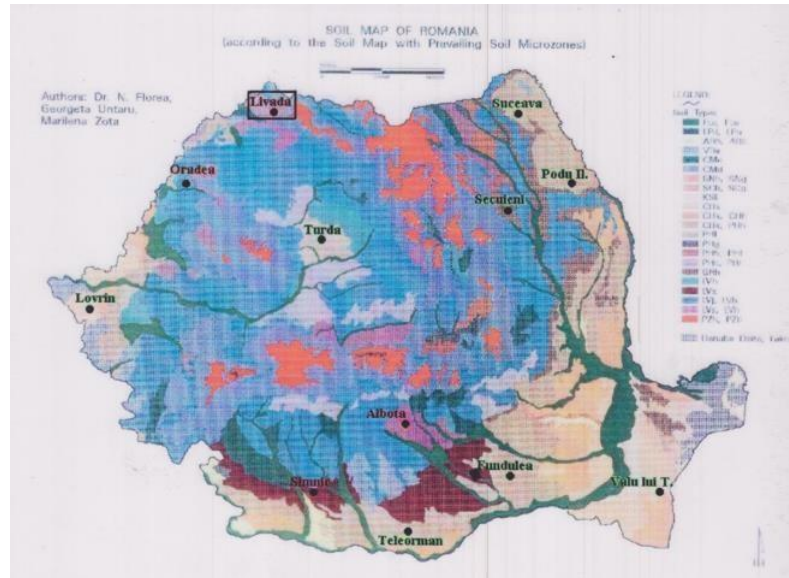
Since 1961

Livada

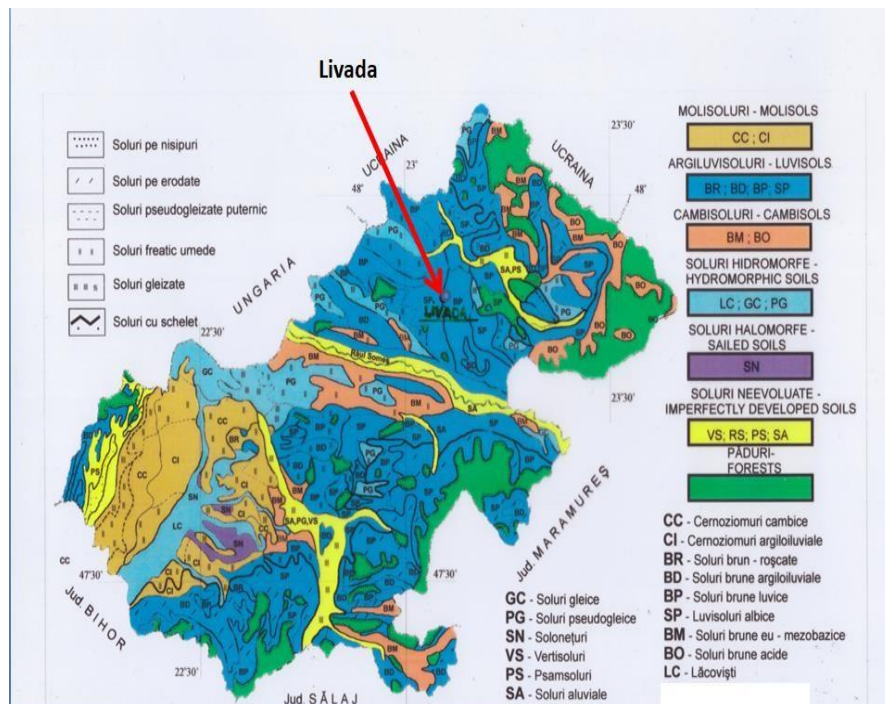


The long term field experiments managed by Research and Development Station Livada include one amendment x fertilisation experiment and three fertilisation experiments and were established in 1961 and 1967, respectively. The experiments are located in North-Western Romania which has a moderate temperate-continental climate of Cfbx type (after Köppen). Experimental soils are classified as Luvisols (WRB Classification System) with an acidic pH, poor in potassium and a relatively low humus content as well as low base saturation.

The experiments were located in the perimeter of the Research Station Livada (47°52'07.3"N 23°07'10.2"E), located in the center of the area occupied by clay-iluvial soils. The brown luvic soil is formed on sedimentary deposits, with groundwater at 4-6 m, the arable horizon being poorly supplied with humus and mobile phosphorus, medium to well supplied with potassium, showing a slightly acidic reaction. The rotation of cultures is predominantly practice on cereals.



Soil map of Romania (according to the Soil Map with prevailing soil microzones)



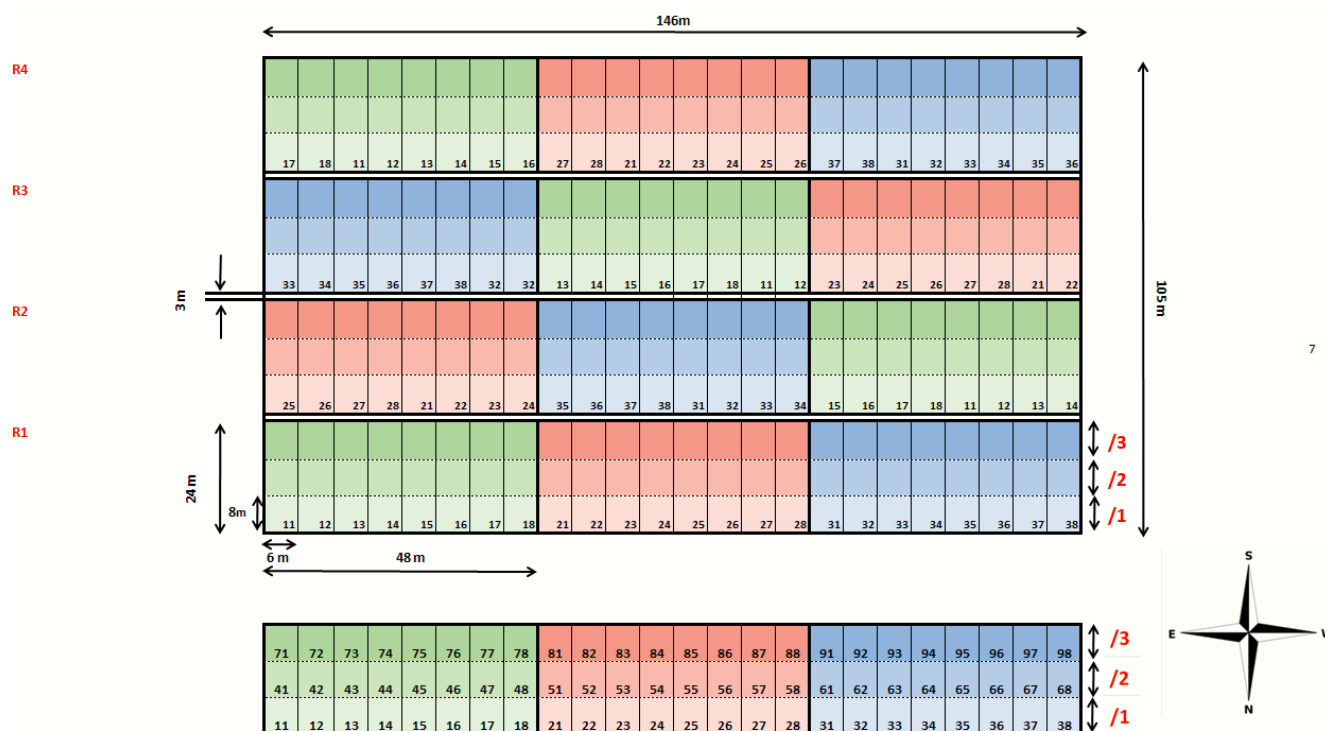
Map representation of soils in Satu Mare county

Characteristics of the studied soils in the plow layer

Properties	Brown forest soil	Luvisol
Clay-%	21,0	19,0
Humus-%	1,41	1,86
pH _{H2O}	5,19	4,80
C.E.C.-me/1000	11,86	11,05
PAL-ppm	11,0	14,0
KAL-ppm	144	64

1. THE LONG TERM EXPERIMENT WITH LIMING AND FERTILISING B5

9A x 8B, n=4 bifactorial experience



A-LIMING-t/ha									B-FERTILIZING				
1961	1966	1971	1977	1986	1998	2012	2022		N	P ₂ O ₅	K ₂ O	G-GUNOI (FYM)	
							Σ	1961	Kg/ha	Kg/ha	Kg/ha	t/ha	
1	0	0	0	0	0	0	0	0	1	0	0	0	0
2	2,5	0	0	0	0	2,5	0	5	2	N	100	0	0
3	5	0	0	0	0	5	0	10	3	P	0	70	0
4	0	2,5	0	2,5	2,5	2,5	0	10	4	NP	100	70	0
5	2,5	2,5	0	2,5	2,5	2,5	0	12,5	5	NPK	100	70	60
6	5	5	0	5	5	5	0	25	6	G	0	0	20
7	0	2,5	2,5	2,5	2,5	2,5	2,5	15	7	NPK+G	100	70	60
8	2,5	2,5	2,5	2,5	2,5	2,5	2,5	17,5	8	>NPK	150	100	80
9	5	5	5	5	5	5	5	35					0

N=ammonium nitrate P=superphosphate K=potassium salt FYM(G)=farmyard manure

-The establishment of the experiments was initiated in the autumn of 1961, by Dr Ioan Boeriu, an advocate of agricultural research in North-Western Transylvania and the manager of the Fertilisers and Amendments Laboratory. From September 1, 1974 until the end of 2022, the management of the trial was taken over by Dr. Paul Kurtinecz. Initially, on two parcels of both the Haplic Luvisol and Albic Luvisol there were created three levels of amendment with 0, 2.5 and 5 t limestone/ha, and 0, 5 and 10 t limestone/ha, respectively.

-The stationary experiments with liming and fertilisers were established according to the method of subdivided plots, in a bifactorial manner. Initially, three levels of the amendment factor were created by applying 0; 2.5 and 5 t of limestone/ha in the case of Haplic Luvisol, and double doses in the case of Albic Luvisol. Consequently, in 1966, by subdividing the length of the replicate into three strips of eight m. each, there were created nine levels of amendment which offer a very wide range of practically testing such ameliorative measurements.

-In these experiments, the „Fertilisation,, factor presents 8 levels and is of „Mangelversuch,, type, offering the possibility of successively testing the effectiveness of nutritional elements, a concept valid for the period in which the experiences were initiated and in a region where information was completely lacking regarding the effect of fertilisation. Regrettably, worldwide, there are relatively few stationary experiments with liming of acidic soils, and for the existent ones the „limestone,, factor does not present several gradual levels.

-Fertilisation was carried out with ammonium nitrate, concentrated superphosphate, potassium salt 40%, semi-fermented farmyard manure. Liming used Bucium limestone and precipitated calcium carbonate from „Azomures,,. The crop rotation practiced in these experiments involved mostly cereals. At the end of the 70's, the beginning of the 80's, at the country level, the issue of liming acidic soils and fertilisation was considered sufficiently elucidated and this led to the abolition of stationary experiments with amendments and fertilisers located in several other research stations (Horodnic, Suceava; Husasaul de Tinca, Bihor; Albota, Arges, etc.). Considering the large prevalence of acidic soils in the northwest, at A.R.S. Livada it was deemed necessary to maintain these experiments, mainly for the continuous follow-up of limestone secondary effects.

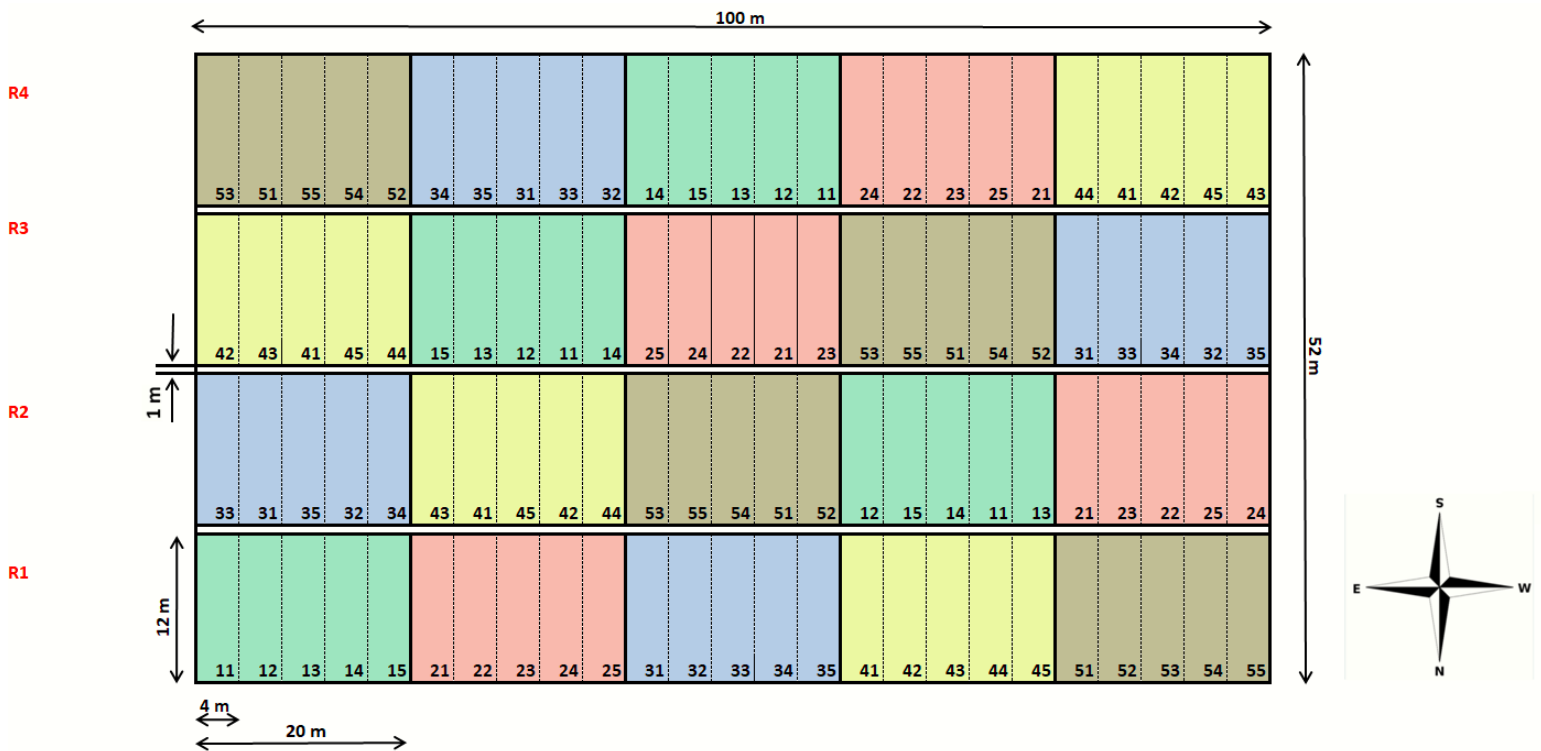
2. THE LONG TERM EXPERIMENT WITH FERTILISING, bifactorial experience B1

$5N \times 5P$, $n=4$

- The long term experiment uses progressive doses of nitrogen (**N1-N5** differentiated according to the cultivated plant) varying as well different doses of phosphorus (**P₀, P₄₀, P₈₀, P₁₂₀, P₁₆₀**)

Nitrogen doses (kg/ha) used

- for vegetables 0, 25, 50, 75, 100
- for wheat after vegetables 0, 30, 60, 90, 120
- for corn after wheat 0, 50, 100, 150, 200
- for wheat after corn 0, 40, 80, 120, 160
- for potatoes and beets 0, 50, 100, 150, 200



3. THE LONG TERM EXPERIMENT WITH FERTILISING bifactorial experience

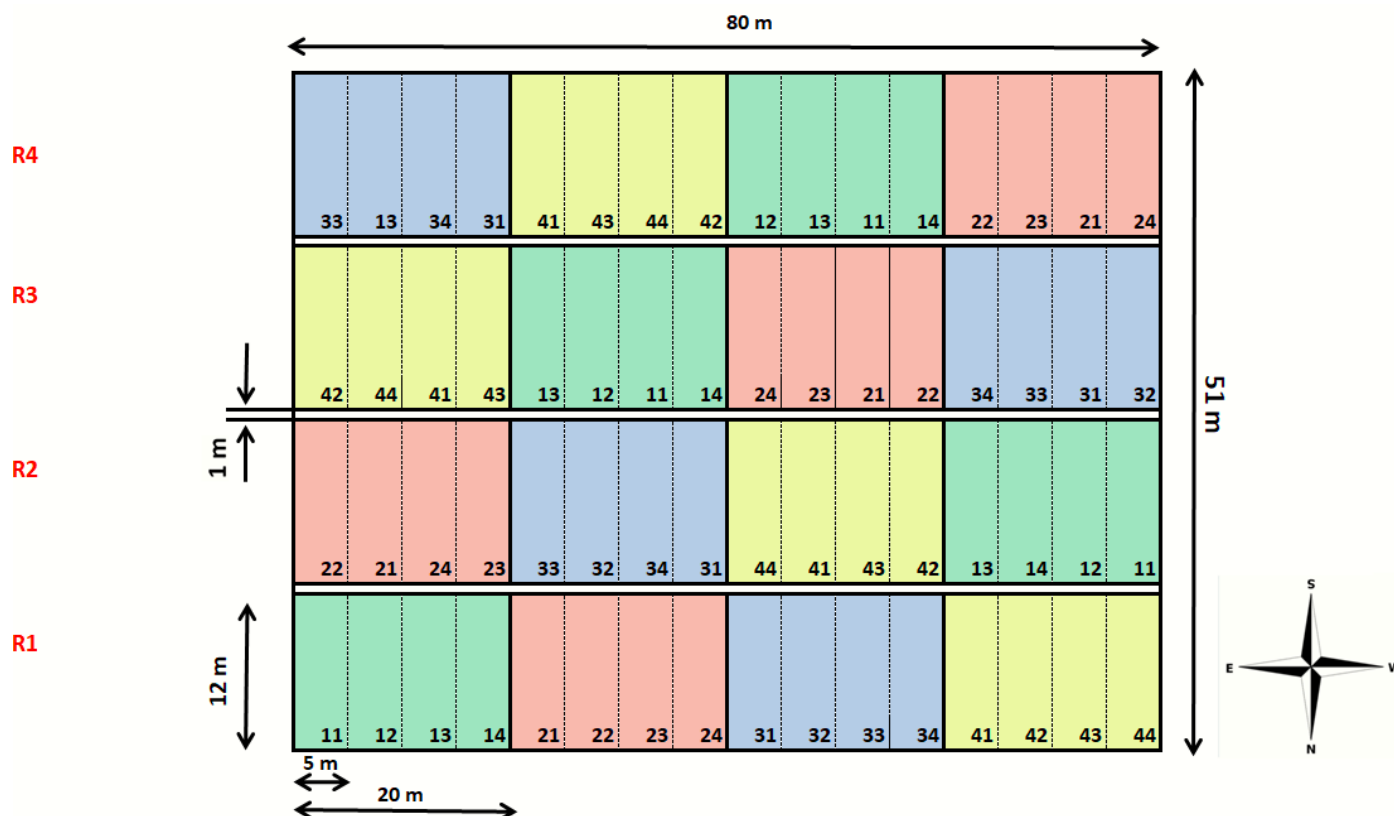
B2

$4NP \times 4K$, $n=4$

- The long term experiment uses progressive doses of potassium (K_0 , K_{50} , K_{100} , K_{150}) varying as well different doses of mineral fertilisers (nitrogen and phosphorus: N_0P_0 , N_1P_0 , N_1P_{80} , N_2P_{80}).

Nitrogen doses (kg/ha) used

- for vegetables N_0P_0 , $N_{25}P_0$, $N_{25}P_{80}$, $N_{75}P_{80}$
- for wheat after vegetables N_0P_0 , $N_{60}P_0$, $N_{60}P_{80}$, $N_{120}P_{80}$
- for corn after wheat N_0P_0 , $N_{100}P_0$, $N_{100}P_{80}$, $N_{200}P_{80}$
- for wheat after corn N_0P_0 , $N_{80}P_0$, $N_{80}P_{80}$, $N_{160}P_{80}$
- for potatoes and beets N_0P_0 , $N_{100}P_0$, $N_{100}P_{80}$, $N_{200}P_{80}$



4. THE LONG TERM EXPERIMENT WITH FERTILISING-bifactorial experience B3

4NP x 4FYM, n=4

- The long term experiment uses progressive doses of farmyard manure (**FYM₀**, **FYM₂₀**, **FYM₄₀**, **FYM₆₀**) varying as well different doses of mineral fertilisers (nitrogen and phosphorus **N₀P₀**, **N₅₀P₀**, **N₅₀P₅₀**, **N₁₀₀P₁₀₀**).

