

STUDY REGARDING EXCESS MOISTURE LANDS AND THE DEVELOPMENT OF ARRANGEMENTS TO REMOVE IT

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Abstract

This paper presents the evolution of the surfaces arranged with works to combat excess humidity, over a 24 years' period, namely, from 1997 until 2021. The surface area of dissiccation and drainage works was 358,000 ha in 1944, and this increased progressively to 3,224,600 ha in 1989. In 2007, the total area of land used for the removal of moisture excess was 3198803 ha, and during the years under study, it decreased by approximately 46000 ha over 10 years and by approximately 50,000 ha over 24 years, from which it can be concluded that the largest decrease was recorded over the period from 1997 to 2007. Drainage and desiccation studies are necessary in the perspective of implementing sustainable agriculture in relation to both the need to conserve water and soil resources and the challenges of climate change.

Keywords: *lands arranged, moisture excess, desiccation, drainage, region.*

INTRODUCTION

Soil is one of the most important natural resources for human survival and well-being. At the same time, this resource is fragile and can easily undergo degradation processes, so mankind must consider promoting optimal land use, maintaining and improving soil productivity and conserving soil resources. (Mihaela B., 2017). One of the processes that can lead to soil degradation is excess moisture, which can manifest itself both on the soil surface and on the soil profile. Excess moisture, from the soil surface or from the soil profile, has significant negative effects both on the soil, through unfavourable moisture changes above the field capacity level, reduced aeration, the manifestation of gelling and pseudo-gelling processes or degradation by depletion, and on plant growth and development, which ultimately leads to reduced agricultural production. Excess moisture occurs on land with slopes below 1-3%, land with microdepressions of water accumulation, on soils with a

high percentage of clay and low permeability. Excess moisture also manifests itself on sloping land, in wetlands throughout our country, at slope changes, in uneven areas, at the outlet of the groundwater table in the day depending on the geological configuration. In the conditions of our country, excessive humidity usually occurs in spring and early summer, which prevents the start of the farming season with effects on the reduction of production and its quality. A particular climatic feature of global climate change is the occurrence of atypical extreme events. These manifest themselves either in the form of very heavy rainfall leading to flooding or in the form of extremely high temperatures leading to atmospheric and soil drought. If it occurs in summer, excess water can lead to crop destruction and degradation of soil physical properties.

The main causes of excess moisture are: precipitation (31%), flooding (floodplain and non-floodplain), precipitation and

groundwater (26%), precipitation and groundwater (15%) groundwater (16%), precipitation and groundwater on saline and alkaline soils with excess moisture (8%), coastal springs on slopes (4%), (Elena C.,2011). At the same time, the area affected by excess moisture also depends on the general climatic characteristics of the year in question. Thus, in rainy years, 7,270,000 ha of agricultural land suffer from excess moisture and in dry years 5,530,000 ha. It is thus considered that 37% of the agricultural area of our country suffers from excess moisture, and by category of use, 31% of the area occupied by grassland and meadows; and 42% of the arable area. By geographical area, land with excess moisture is distributed as follows:

- the south-eastern area 17% of the area suffers from excess moisture and 35% is at risk of rising groundwater tables.
- eastern area -25% and those with danger of rising groundwater table 6%.
- southern area - 37% and with danger of rising groundwater 14%.
- central area – 28% suffer from excess moisture and 6% are at risk of rising groundwater tables.
- Subcarpathian area – 33% of the land suffers from excess moisture, 12% with danger of rising groundwater table.
- northern and mountain area – 38% of the land suffers from excess moisture,

2% with danger of rising groundwater table.

- western area – the highest proportion of land with excess moisture (65%), with 13% of the area likely to have a rising groundwater table. A significant percentage (6%) is occupied by saline and alkaline soils with excess moisture.

MATERIAL AND METHOD

In order to study the current situation of land developed with works to combat excess moisture, statistical data provided by the INSS of Romania were used and the percentage method was applied, taking into account the categories of use of developed land (average period 2017-2021).

Data from ANIF (National Land Improvement Administration) were also used to study the dynamics of drainage and drainage works at national level, using data from 1997 and data from INSS for the year 2007 and the average of the years 2017-2021, thus resulting in a 24-year statistic.

RESULTS AND DISCUSSIONS

From Table 1, it results that at national level, the total area developed with drainage and drainage works, by land use categories, (average years 2017-2021), was 3149953 ha, of which agricultural area 2900426.8 ha (92.08%) and non-agricultural area 249526.2 ha (7.92%).

Table 1

**Situation of land with drainage works
(Media 2017-2021)**

Item No.	Field category	Surface -ha-	% of total landscaped**
1	Total landscape area	3149953	100
2	Agricultural area under development	2900426,8	92,08
3	Arable land	2503376,2	79,47
4	Natural pastures	259053,6	8,22
5	Natural grasslands	111079	3,53
6	Vineyards and nurseries	14677	0,47
7	Orchards and fruit nurseries	12241	0,39
8	Landscaped non-agricultural area	249526,2	7,92

<http://statistici.inss.ro:8077/tempo-online/#/pages/tables/inss-table> (29/10/2022)
** own calculations

Within the agricultural area managed with works to combat excess moisture, by category or mode of agricultural use, according to Figure 1, it can be seen that arable land 2503376.2 ha (79.47%) has the largest share, followed by natural pasture 259053.6 ha (8.22%) and non-agricultural area 249526.2 ha (7.92%). The lowest percentages are recorded in natural ditches with drainage works 3.53%, followed by vineyards and vineyard nurseries

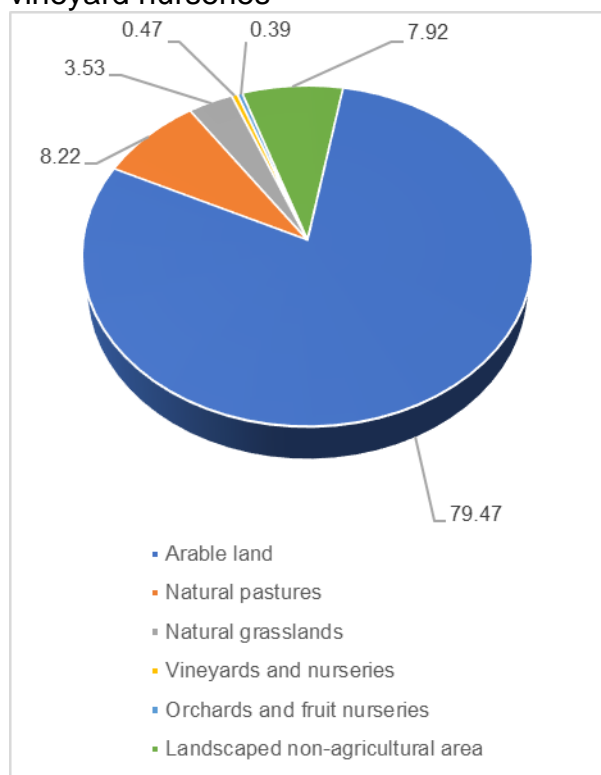


Fig. 1. Structure of areas with drainage works

0.47% and finally orchards and fruit nurseries 12241 ha (0.39%), one of the explanations being that these categories of use are mainly established in hill and mountain areas, where the natural drainage of the soil is more energetic.

The evolution of scientific concepts on the influence of works to prevent and combat excess moisture on the surrounding environment has led to the emergence of systematic drainage and dewatering, which are carried out especially in areas with prolonged excess moisture.

The surface area of the land developed with drainage works was 358,000 ha in

the year 1944, and it increased progressively as follows: 588,000 ha in the year 1955, 789,000 ha in the year 1965, 1,966,000 ha in the year 1975, 2,539,300 ha in the year 1984; and in 1989 the peak of dewatering and drainage works was reached, with an area of 3,224,600 ha. In 1997, the drainage infrastructure managed by ANIF was as follows: the surface area of drainage and drainage works decreased to 3198803 ha and was as follows: areas with excess water discharge by pumping (1,522,087 ha) and with gravity water discharge 1,679,717 ha. Within these areas there were 443 drainage facilities, belonging to 12 ANIF branches, containing 56,565 km of main drainage structures, 25,695 km sewers, 713 sewage pumping stations, 33,477 bridges and culverts, 976 culverts and 39,645 km of absorbent drains and sewers.

After the implementation of the water-improvement schemes, particular importance had to be attached to their exploitation and behaviour over time and to the evolution of the physical, chemical and biological properties of the soil. Unfortunately, after the retrocession of the property right, by the application of law no. 18/1991, besides the fact that the arable area was strongly fragmented, the drainage lines were not taken into account, the individual plots being located perpendicular to the absorbing drains. 60-80% of the hydro-technical structures on the canal network have deteriorated because of the lack of maintenance work and decompletion, especially after 1990, through the removal of slabs from embankment reinforcements, near culverts, from the connection of reaches, canal confluences, control and flow measurement sections. Table 2 shows the dynamics of land developed with works to combat excess moisture during the years 1997, 2007 and the average years 2017-2021, i.e. practically over a 24 years' period.

Table 2

Dynamics of land developed with dewatering and drainage works at national level (ha)

Item No.	Field category	Years				
		1997*	2007*		2017-2021**Average	
		Effective	Effective	$\pm\Delta 1997$ vs 2007**	Effective	$\pm\Delta 1997$ vs Media 2017-2021
1	Total landscape area	3198803	3152484	-46319	3149953	-48850
2	Landscaped agricultural area	2949913	2911441	-38472	2900426,8	-49486,2
3	Arable land	2553962	2511146	-42816	2503376,2	-50585,8
4	Natural pastures	256820	262148	+5328	259053,6	-2233,6
5	Natural grasslands	109943	110762	+819	111079	+1136
6	Vineyards and nurseries	15676	14756	-920	14677	-999
7	Orchards and fruit nurseries	13512	12629	-883	12241	-1271
8	Landscaped non-agricultural area	248890	241043	-7847	249526,2	+636,2

* <http://statistici.insse.ro:8077/tempo-online/#/pages/tables/insse-table> (29/10/2022)

** own calculations

Thus, it can be observed that, in 1997, the total area of land used for the removal of excess moisture was 3198803 ha, and during the years taken in the study, it decreased by about 46000 ha over 10 years and by about 50,000 ha over 24 years, from which it can be concluded that the largest decrease was recorded over the period from 1997 to 2007 (fig. 2). Within the areas occupied by grassland, hayfields, vineyards, orchards, the situation is slightly different in contrast to agricultural land, in the sense that within these land uses, during the 24 years

taken into account in the study, the areas fitted with works to remove excess moisture have increased in certain periods of time and in certain land uses (table 2). Thus, as far as land occupied by natural pastures is concerned, the areas developed with drainage and drainage works increased by 5328 ha in 2007, and then decreased by about 3095 ha between 2017-2021, but even in these conditions compared to 1997, the areas increased during the 24 years studied by about 2234 ha (Figure 3).

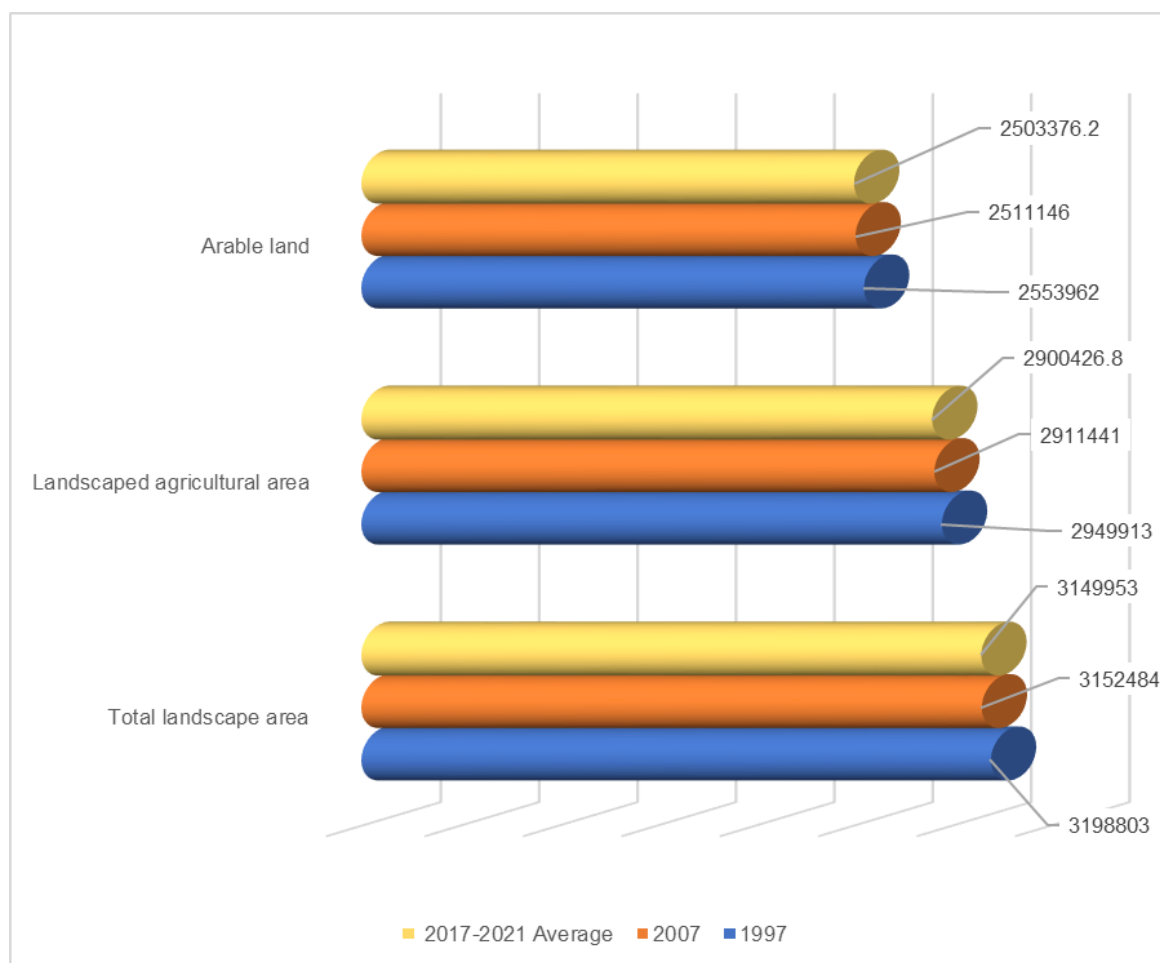


Fig. 2. Landscaped areas dynamics – total, farming, arable (ha)

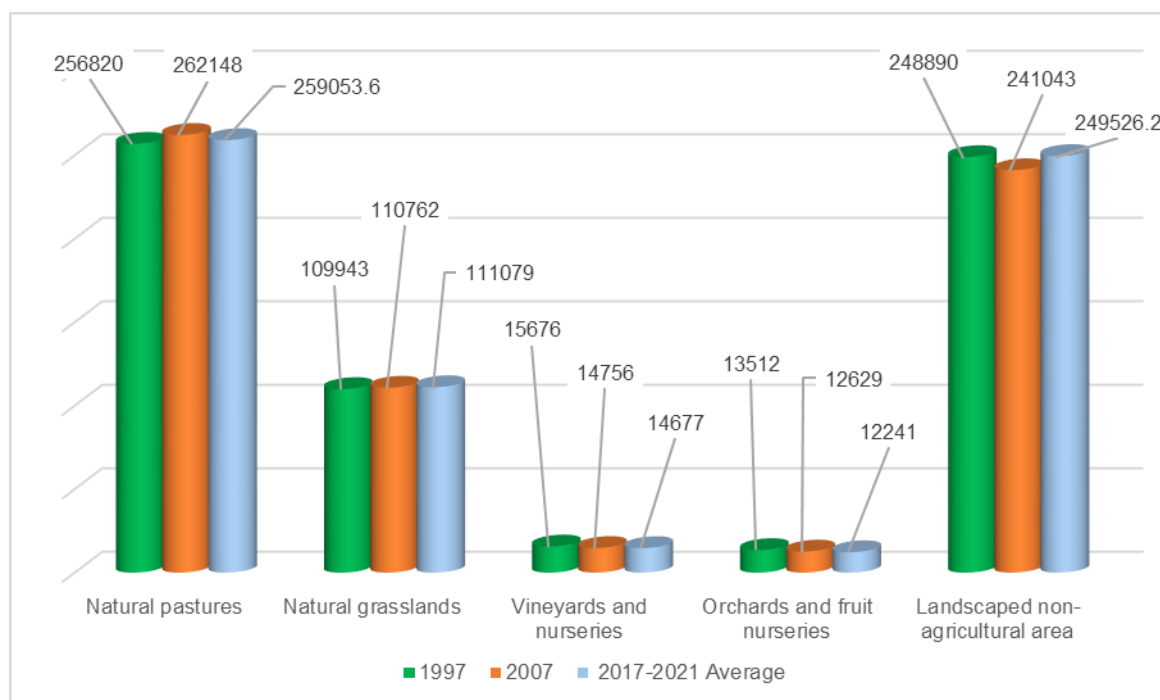


Fig. 3. Landscaped areas dynamics – pastures, meadows, vineyards, orchards, non-agricultural (ha)

The land occupied by vineyards and vine nurseries, as well as the land occupied by orchards and fruit nurseries, over the 24 years of the study, recorded decreases in the area under cultivation of about 1000 ha in the case of vineyards and about 1300 ha in the case of orchards. As regards the non-agricultural area planted with works to combat excess moisture, over the 24 years, it was observed that compared to the year 1997, in 2007, it decreased by about 7800 ha, and then increased in the years 2017-2021, thus registering an increase of about 636 ha compared to 1997, (table 2).

CONCLUSIONS

At the national level, the surface area of drainage and drainage works was 358,000 ha in 1944, and it increased progressively, reaching 3,224,600 ha in 1989.

Since 1990, 60-80% of the hydrotechnical structures on the canal network have deteriorated because of the lack of maintenance work and decompletion, by the removal of slabs from embankment reinforcements, from around culverts, from the connection of reaches, from the confluence of canals, from control and flow measurement sections.

In 1997, the total area of land with works for the removal of excess moisture was 3198803 ha, and during the years under study, it decreased by about 46000 ha during 10 years and by about 50000 ha during 24 years, from which it can be concluded that the largest decrease was recorded in the period 1997-2007.

As for the average years 2017-2021, the total landscaped area with drainage and drainage works, by land use categories, was 3149953 ha, of which agricultural area 2900426.8 ha (92.08%) and non-agricultural area 249526.2 ha (7.92%).

In terms of arable area, compared to 1997, it has decreased by about 43000 ha, and by about 51000 ha after 24 years. Within the areas occupied by pastures, hayfields, vineyards, orchards, during the 24 years taken into account in the study, the areas developed with works for the

removal of excess moisture have increased in certain periods of time and at certain land use patterns. Thus, the land occupied by natural pastures, and arranged with drainage and drainage works increased by 5328 ha in 2007, and then decreased by about 3095 ha between 2017 and 2021, but even in these conditions compared to 1997, the areas increased during the 24 years taken in study by about 2234 ha.

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