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CURRENT ASPECTS AND PERSPECTIVE OF IRRIGATION INFRASTRUCTURE IN WEST PART OF ROMANIA

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Abstract: Under the current pedoclimatic conditions, irrigations have a complementary character for precipitation and have an important role in obtaining high and relatively stable annual crops, to ensure food safety for population and for achieving an export surplus, as well as environmental protection. Current studies demonstrate that irrigation is needed in Romanian Plain, South Moldavia and Dobrogea, where climatic evolution indicates a tendency of aridity and desertification, and where the irrigation water supply should have a permanent character. It also shows the importance of introducing irrigation in local arrangements in other parts of the country. The research program aims to analyze the situation of the irrigation sector in western Romania, the West Region with the counties Arad, Timis, Caraş-Severin and Hunedoara, by presenting the current irrigation arrangements and their functionality, as well as the examination of the irrigable potential through the implementation of local irrigation facilities, local systems managed by single investors or associations.

Keywords: irrigation arrangements, water resources, water quality, water for irrigation, aridization

1. INTRODUCTION

Current specialized studies show that irrigation is needed in the Romanian Plain, Southern Moldavia and Dobrogea, where the climatic evolution indicates a tendency of drying and desertification, and where the water supply from the irrigation will have a permanent character in addition to the water from the rainfall. It also shows the importance of introducing irrigation in local arrangements for other areas of the country.

The large irrigation systems in Romania were built since 1970. By the end of 1989, the total area arranged with irrigation infrastructure was about 3.1 million ha, comprising 375 large irrigation systems.

Starting with 2004, at the request of organizations and federations of land improvements, the National Agency for Land Improvements has handed over to them their irrigation infrastructure [1].

The functional irrigation arrangements of the total area arranged with irrigation in 2004 represented 50%, and in 2013 they represented 45%, of which in the administration of the National Agency for Land Improvements, decreasing from 41% in 2004 to 46% in 2013, and in the property / use of OUAI / FOUAI, decreasing from 100% in 2004 to 43% in 2013 [2].

Table 1 The situation of irrigation arrangements in Romania [3]

Indicator	Year 2004	Year 2013
Total irrigation arrangements:	3.002 (100%)	2.990 (99%)
•functional	1.502 (50%)	1.356 (45%)
•nonfunctional	1.500 (50%)	1.635 (55%)
Administered by ANIF	2.532 (84%)	2.134 (71%)
•functional	1.032 (41%)	990 (46%)
•nonfunctional	1.500 (59%)	1.145 (54%)
Property/usage AUAI/OUAI/FOUAI	470 (16%)	856 (29%)
•functional	470 (100%)	366 (43%)
•nonfunctional	-	490 (57%)
Total irrigated surface:	327 (11%)	151 (5%)
- administered by ANIF	202 (8%)	12 (0,5%)
- property/usage AUAI/OUAI/FOUAI	125 (26%)	139 (16%)

In 2016, the total area set aside for irrigation works was 2,991,943 ha of which, by sprinkling 2,665,594 ha, by furrows 276,624 ha, and by flooding 49,725 ha [3].

At the level of 2018, 580 OIFs and 24 FOIFs were constituted and registered in the National Register of Land Improvement Organizations.

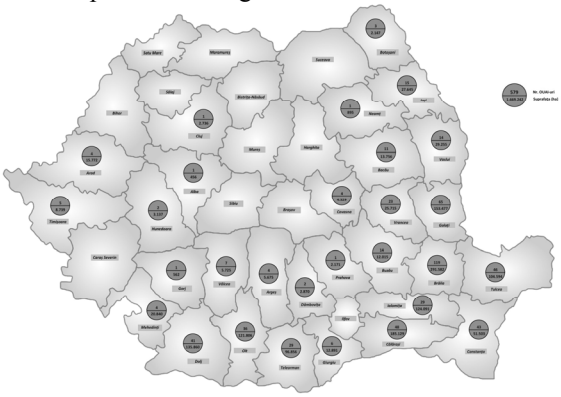

Figure 1. The stage of the establishment of Land Improvement Organizations - 2018 [4]

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Through the financing possibilities available, the private stakeholders represented by the farmers - by setting up organizations or associations and taking over the infrastructure, as well as ANIF the network administrator - must take steps regarding the rehabilitation and maintenance of the existing facilities.

Currently there are 3 financing ways for the rehabilitation and development of irrigation arrangements:

- from private funds;
- from the National Program for Rural Development through AFIR sub-measure 4.3;
- through the National Program for the Rehabilitation of the Main Irrigation Infrastructure in Romania.

2. CURRENT SITUATION OF THE IRRIGATION INFRASTRUCTURE IN ROMANIA

It can be seen that the total area set up for irrigation works remained relatively constant during the 1997 - 2013 statistical period, diminishing insignificantly due to the removal of the areas necessary for the extension of the localities from the agricultural circuit.

Between 2013 and 2016, we can observe a stabilization of the surface arranged with irrigation works at national level on the area of 3 149 111 hectares.

Table 2. The surface of the lands arranged with irrigation works by development regions [5]

Development regions	Year 1997	Year 2013	Year 2016
	Ha		
TOTAL	3184047	3149111	3149111
Region NORTH-WEST	22605	18178	18178
Region CENTER	18096	15400	15400
Region NORTH-EAST	137318	137184	137184
Region SOUTH -EST	1199506	1197854	1197854
Region SOUTH - MUNTENIA	1081584	1075492	1075492
Region BUCURESTI - ILFOV	62225	49560	49560
Region SOUTH-WEST OLTENIA	608021	601119	601119
Region WEST	54692	54324	54324

The situation of the effectively irrigated agricultural area, with at least one watering, however, has undergone large oscillations between 1997 and 2013, supporting a drastic decrease between 2000 and 2005, with a return to 2013.

Table 3. The agricultural surface actually irrigated, with at least one watering, by development regions [5]

Macroregions, regions of development and counties	Year 1997	Year 2000	Year 2005	Year 2013	Year 2016
	Ha				
TOTAL	127790	216138	45719	180931	152937
Regiunea NORD-VEST	12	98	-	-	-
Region NORTH-WEST	365	1439	40	329	744
Region CENTER	5198	3204	359	4933	9607
Region NORTH-EAST	64150	121179	24069	139231	109904
Region SOUTH -EST	27957	58452	4745	26341	23774
Region SOUTH - MUNTENIA	737	993	79	:	:
Region BUCURESTI - ILFOV	25799	29844	14211	9843	8574
Region SOUTH-WEST OLTENIA	3572	929	2216	254	334
Region WEST					

Between 2013 and 2016, a stabilization of the agricultural area can be observed, effectively irrigated at national level, with at least one watering, on the surface of 150 000 hectares [6].

Table 4. The situation of the surfaces on which watering was applied in 2016 [3]

Branch	Surfaces on which watering was applied			
	Total		Organizations	
	cumulative watering	watering I	cumulative watering	watering I
Someş-Criş	0,0	0,0	0,0	0,0
Tisa-Someş	0,0	0,0	0,0	0,0
Timiş-Mureş Inferior	334,0	334,0	0,0	0,0
Mureş-Oltul Mijlociu	0,0	0,0	0,0	0,0
Mureş-Oltul Superior	955,5	743,5	955,5	743,5
Dunăre-Jiu	17242,0	5256,0	13964,0	4826,0
Olt-Dunăre	18966,0	3318,0	10479,0	2018,0
Teleorman-Neajlov	4063,0	2549,0	4063,0	2549,0
Argeş-Dâmboviţa	0,0	0,0	0,00	0,00
Ialomiţa-Calmatui	52170,7	21155,7	51899,7	20977,7
Dunărea Inferioară	160039,5	91394,6	134481,0	84847,5
Dobrogea	10969,6	4108,0	10789,6	3940,0
Moldova Sud	26010,1	13713,1	22616,1	12264,1
Moldova Nord	12159,0	7399,0	11864,0	7299,0
Buzău-Moldova Sud	3842,1	2904,5	715,0	715,0
Prahova	138,8	138,8	0,0	0,00
TOTAL	306890,3	153014,2	261826,9	140179,8
of which FOUAI	29558,0	14755,0	/	/

The reported situation of the surfaces on which watering was applied indicates the total area of 306

890,30, of which for 153 014,20 ha watering I, out of a total contracted of 349 788,50 ha.

The agricultural exploitation of the land makes it necessary to rehabilitate the primary infrastructure of land improvements - pumping stations and the main canal network, but also of the other component parts of the arrangement.

The National Program for the Rehabilitation of the Main Irrigation Infrastructure in Romania foresees a total investment value of 1.015 billion euros with a financing period of 5 years between 2016 - 2020.

The national program for the rehabilitation of the primary irrigation infrastructure in Romania includes several objectives that will be subject to the rehabilitation action in three stages. The total area proposed for rehabilitation is 2 006 941 ha in 86 irrigation arrangements that includes the following objectives: 110 base pumping stations, 137 refueling stations, 2 525 m discharge pipes, 1 997 481 m adduction channels, 2 885 073 m distribution channels and 4 995 hydrotechnical constructions.

Phase I foresees the rehabilitation of the main irrigation infrastructure in the public domain of the state, composed of 69 basic pumping stations, 87 re-pumping stations, 2 525 m pipelines, 1 226 505 m adduction channel, 1 965 488 m distribution channels, and 3 125 hydrotechnical constructions in 40 irrigation arrangements established by the Organizations and Federations of the Land Improvement Organizations, which accessed Measure 125a within the PNDR 2007 - 2013.

Phase II - foresees for the rehabilitation of the main irrigation infrastructure in the public domain of the state, consisting of: 32 basic pumping stations, 37 re-pumping stations, 678 389 m supply channels, 494 478 m distribution channels and 1 345 hydrotechnical constructions in 37 viable irrigations facilities that have been established Organizations and Federations of the Land Improvement Organizations that will be able to access sub-measure 4.3 of the PNDR 2014-2020.

Stage III - provides for the rehabilitation of the main irrigation infrastructure in the public domain of the state, consisting of: 9 basic pumping stations, 13 re-pumping stations, 92 587 m supply channels, 425 107 m distribution channels and 525 hydrotechnical constructions in 9 viable irrigations facilities that are not currently constituted OUAI [7].

Table 5. Structure of financing and budget allocations through PNRIPIR [5]

Financing program	Proposed arrangements for rehabilitation	Public funding	
		Year	Value (euro)
PNRIPIR phase I	40	2016	145.000.000
		2017	169.000.000
PNRIPIR phase II	37	2018	198.490.000
		2019	232.230.000
PNRIPIR phase III	9	2020	269.630.000

Sub-measure 4.3 "Investments for the development, modernization or adaptation of the agricultural and forestry infrastructure", according to Regulation (EC) 1305/2013, art.17, in measure 04 - Investments in physical assets - and contributes to the areas of intervention: 2A Improving the performance economic of all farms and facilitating the restructuring and modernization of farms, especially in order to increase market participation and orientation, as well as agricultural diversification, 2C Improving the economic performance of forests and 5A Efficiency of water use in agriculture.

The support granted by sub-measure 4.3 for investments in the modernization of the secondary irrigation infrastructure is part of DI 5A. Efficient use of water in agriculture and has a positive effect by promoting new technologies, saving water in agriculture and reducing the costs caused by water consumption. Through the submitted projects, investments will be financed in the modernization of the secondary irrigation infrastructure, the buildings related to the pumping/ re-pumping/pressure stations and/or the connection to utilities, including the construction/modernization of the irrigation water collection and storage basins.

The total public contribution, for the intervention area DI 5A - Efficiency of water use in agriculture, is 435,294,118 Euros, of which:

- 15% - the contribution of the Government of Romania;
- 85% - European Union contribution [8].

Table 6. Status of projects financed by Sub-measure 4.3 until 03.01.2019 [5]

Financing program	Submitted Projects		Contracted project	
	Number	Value (euro)	Number	Value (euro)
Sub measure 4.3	226	226,680,858	185	180,628,946
Sub measure 4.3 ITI	7	6,798,482	0	0

3. CURRENT STATUS OF IRRIGATION INFRASTRUCTURE IN WESTERN ROMANIA

The National Agency for Land Improvements (ANIF) has an inventory of 37 534 hectares of irrigation in the West Development Region.

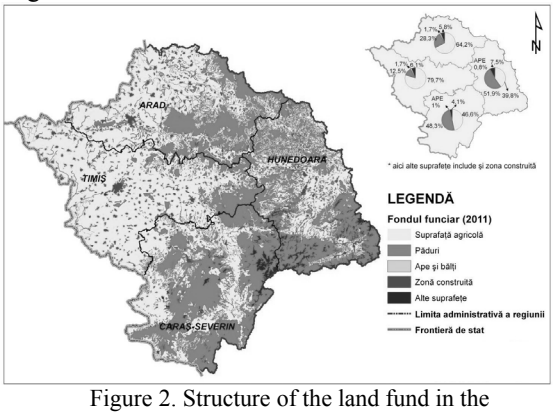

Figure 2. Structure of the land fund in the West region [9]

The main irrigation arrangements in Timiş County are:

- Şag-Topolovăţ arrangement – 8.071 ha;
- Periam arrangement - 589 ha;
- Beregsău arrangement - 542 ha;
- Semlac – Pereg arrangement - 8.394 ha;
- Fântanele – Şagu arrangement - 6.920 ha;
- Păuliş - Matca arrangement - 3.962 ha;
- Mureşel – Ier arrangement - 3.033 ha;
- Neudorf arrangement - 910 ha;
- Cermei Şicula arrangement - 240 ha;
- Chişindia Buteni arrangement - 131 ha;
- Ostrov-Clopotiva-Haţeg arrangement - 2.679 ha;
- Sântandrei – Deva arrangement - 630 ha;
- Geoagiu arrangement - 415 ha;
- Compl. ingr. Turadaş arrangement - 391 ha;
- Simeria – Băcia arrangement - 373 ha;

Table 7. Surfaces arranged in the ANIF inventory in 2018 [2]

	Type of arrangement	arranged surface (ha)
ANIF Timiş	Irrigation	9.202
	Drainage - drainage	438.788
	Combating soil erosion	40.913
ANIF Arad	Irrigation	23.740
	Drainage - drainage	226.105
	Combating soil erosion	10.284
ANIF Caraş-Severin	Irrigation	0
	Drainage - drainage	28.627
	Combating soil erosion	43.944
ANIF Hunedoara	Irrigation	4.536
	Drainage - drainage	14.458
	Combating soil erosion	35.152

In 2016, most of the irrigation arrangements in the Western region, inventoried in the ANIF patrimony and partially delivered to the OUAI, were non-functional.

Table 8. The stage of the functionality of the facilities delivered to OUAI [2]

Name of the OUAI	Name of the arrangement	Surface net (ha)	The state of the infrastructure	
			Functional	Nonfunctional
Bistra SPP 1	Sag Topolovat	794	0	794
SPP 2	Sag Topolovat	2341	0	2341
DANI SPP4si 5	Sag Topolovat	2314	0	2314
DANI SPP6 si 7	Sag Topolovat	1753	0	1753
ADA SPP 8	Sag Topolovat	1370	0	1370
TOTAL ARRANGEMENT		8572	/	/
Peregu Mare	Semlac Pereg	4,371	3671	700
Semlac Nădlac	Semlac Pereg	3,973	0	3973
TOTAL ARRANGEMENT		8,344	/	/
Arad Fântânele	Fântânele Şagu	3,875	0	3875
Şagu II	Fântânele Şagu	2,964	0	2964
TOTAL ARRANGEMENT		6,839	/	/
AUAI Păuliş Horia	Păuliş Matcă	2,397	0	2397

The total area irrigated with at least one watering, comprising both public and private infrastructure - in local irrigation facilities, at the level of 2016 was 334 hectares [4].

Table 9. The total surface irrigated with at least one watering West region [4]

The total surface irrigated with at least one watering	Macroregions, development regions and counties	Year 1997	Year 2013	Year 2016
		Ha		
Agricultural surface arranged	Region WEST	3572	254	334
	Arad	3359	254	0
	Hunedoara	173	0	0
	Timis	40	0	334
	Caraş-Severin	0	0	0

Within the National Program for the Rehabilitation of the Main Irrigation Infrastructure in Romania, updated in 2016, it is foreseen in the second stage the allocation of funds for the rehabilitation of the irrigation arrangements Semlac - Pereg and Fântanele - Şagu, in Arad county. The other irrigation arrangements in the West region are not included in the National Program for the Rehabilitation of the Main Irrigation Infrastructure in Romania, most of them being declared publicly useless.

4. CONCLUSIONS

The agricultural potential of the Western Region is very high, through the large agricultural areas of the component counties of the region, but also through the infrastructure of existing land improvements. Surface water sources, soil quality, labor force and transport infrastructure can create the conditions for a well-developed agriculture over time.

By extending the existing financing paths or by identifying new ones, it is necessary to rehabilitate and modernize the existing irrigation infrastructure, which can only be achieved through the collaboration between the owners of agricultural lands and the specialized institutions of the state.

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